EDISON ELECTRIC INSTITUTE BULLETIN

MARCH, 1942

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EDISON ELECTRIC INSTITUTE

THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

December, 1941

SOURCE AND DISPOSAL OF ENERGY—MONTH OF DECEMBER

	1941	1940	%
GENERATION* (Net)			
By Fuel Burning Plants	11,147,565,000	9,057,377,000	+23.1
By Water Power Plants	4,491,459,000	4,398,558,000	+ 2.1
Total Generation	**15,639,024,000**	**13,455,935,000**	**+16.2**
Add—Net Imports Over International Boundaries	85,342,000	79,404,000	+ 7.5
Less—Company Use	281,140,000	157,702,000	+78.3
Less—Energy Used by Producer	356,774,000	535,419,000	−33.4
Net Energy for Distribution	**15,086,452,000**	**12,842,218,000**	**+17.5**
Losses and Unaccounted For	2,333,299,000	1,947,200,000	+19.8
Sales to Ultimate Customers	**12,753,153,000**	**10,895,018,000**	**+17.1**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of December 31st			
Residential or Domestic	26,025,513	24,951,906	+ 4.3
Rural (Distinct Rural Rates)	986,719	685,812	.....
Commercial or Industrial:			
Small Light and Power	4,299,939	4,260,255	+ 0.8
Large Light and Power	172,668	177,905	
Other Customers	122,493	115,123	.....
Total Ultimate Customers	**31,607,332**	**30,191,001**	**+ 4.7**
KILOWATTHOUR SALES—During Month of December			
Rural or Domestic	2,392,699,000	2,222,268,000	+ 7.7
Rural (Distinct Rural Rates)	147,892,000	108,912,000	+35.8
Commercial or Industrial:			
Small Light and Power	2,188,823,000	2,033,724,000	+ 7.6
Large Light and Power	6,866,867,000	5,448,145,000	+26.0
Street and Highway Lighting	223,620,000	216,601,000	+ 3.2
Other Public Authorities	301,081,000	248,045,000	+21.4
Railways and Railroads:			
Street and Interurban Railways	368,518,000	368,012,000	+ 0.1
Electrified Steam Railroads	200,343,000	182,571,000	+ 9.7
Interdepartmental	63,310,000	66,740,000	− 5.1
Total to Ultimate Customers	**12,753,153,000**	**10,895,018,000**	**+17.1**
Revenue from Ultimate Customers	**$239,460,500**	**$219,913,100**	**+ 8.9**

RESIDENTIAL OR DOMESTIC SERVICE (Revised Series)

AVERAGE CUSTOMER DATA—For the 12 Months Ended December 31st			
Kilowatthours per Customer	986	952	+ 3.6
Average Annual Bill	$36.78	$36.56	+ 0.6
Revenue per Kilowatthour	3.73¢	3.84¢	− 2.9

* By Courtesy of the Federal Power Commission.

Vol. 10, No. 3, EDISON ELECTRIC INSTITUTE BULLETIN; published monthly. Entered as second-class matter Aug. 17, 1933, at the post office at Philadelphia, Pa., under the act of March 3, 1879. Publication office, 56th and Chestnut Sts., Philadelphia, Pa. Editorial office, 420 Lexington Ave., New York, N. Y. Subscription rate $2.00 per year in the United States; $3.00 per year in foreign countries.

The Edison Electric Institute does not assume responsibility for, nor necessarily endorse or approve, statements made by contributors to the BULLETIN.

EDISON ELECTRIC INSTITUTE BULLETIN

Volume 10 MARCH, 1942 No. 3

More About Blackouts

Dissimilarities of British and American Needs

By Alexander Maxwell

Director of Engineering, EEI

IN spite of the large amount of information that has appeared during recent months on blackouts, and particularly on blackout lighting, it is probable that the popular view of the American situation, and perhaps to some extent the views of local governmental officials, are not as clear as they might be. This deficiency is certainly not due to a lack of technical information, nor of well developed programs for many excellent technical papers have been published in recent months and a number of these have led to definite proposals for future procedure, and even complete programs. These proposals were well supported from technical considerations and sound in other respects to the extent that their fundamental assumptions were sound. It is with these fundamentals that these observations are particularly concerned because they have not received much critical discussion in comparison with the amount of discussion that has been devoted to British experience and to specific plans based almost exclusively on this British experience.

Differences between the American situation and the British situation with respect to air raids and blackout precautions are almost if not quite as significant as the similarities, consequently it is not advantageous to fashion all procedures on the British model without due allowance for adjustment to American conditions. It may be taken for granted that the American military authorities have taken all considerations into account and it is highly probable that the civilian experts who have written or spoken on the subject have done so as well but the actual execution of a large amount of preparatory work will be by other persons, probably by a large number of diverse local authorities, such as state, or county, or municipal governments, and they may be influenced by many voluntary groups and even by general popular opinion. It is with these categories that we should be concerned, in the interests of orderly consideration, absence of confusion, and an expenditure of effort reasonably commensurate with the end to be achieved. Judging from published reports of the opinions and actions of many of these persons with considerable local influence there appears to be a real danger that these blackout matters may be decided upon an emotional rather than a realistic basis.

There seems to be reason to conclude that the popular confusion of thought arises from our rather casual acceptance, in America, of British experience and British practices without due consideration of the important differences between the situations of the two countries. This popular, although uncritical, deference to British practices is itself understandable enough, since the record of British experience is practically the only record generally available and the fortitude of the British under their trials has aroused the admiration of their allies, and very likely of their enemies also. Nevertheless, the obvious starting point for American consideration of blackout precautions against air raids is to compare, in the light of the physical situation, our proposed practices with British actual experience. Reliable information from other European countries is scanty or not generally accessible, and most of it refers to the measures planned in 1939 at the outbreak of the war or shortly thereafter, with little or nothing to indicate the later experience of these continental countries.

The outstanding difference between the continental United States and Great Britain with respect to hostile air raids is geographic. When Great Britain entered the war, and long before Dunkirk, England was as accessible from Western Germany as Kiel, Hamburg and Wilhelmshafen have since been accessible to the British. Without going into the many speculations that have appeared concerning the vulnerability of the United States, often under quite good authority, it is obvious that the situation of continental North America is utterly different from that of Great Britain.

Another consideration is also related to geography, or perhaps more accurately to astronomy. It is important to recall that London is situated at 52 deg North Latitude, while Washington, for example, is situated at 38 deg North; this difference is great enough to provide significant differences in the relative dis-

WAR CANCELS ANNUAL CONVENTION

Upon the recommendation of the Operating Committee, approved by the Board of Trustees, the annual convention of the Edison Electric Institute, which was to have been held at Atlantic City the first week of June has been cancelled, C. W. Kellogg, President of the Institute, announced on March 12.

Due to the heavy demands the war is imposing upon electric utilities it was decided that instead of an annual convention, business meetings would be called as occasion may require. When such meetings are called an effort will be made to give as much advance notice to the membership as possible.

The regular Institute committees will continue to function. These have already suited their organization, studies, deliberations and schedules to the tasks of wartime.

tribution of sunlight, twilight and night. While these differences may have effects in both directions, either to increase or decrease vulnerability according to the views of qualified experts, the immediate consideration is that they are certainly different. Moreover, quite apart from their influence upon vulnerability, they would certainly be of substantial weight in matters affecting the control of external artificial lighting.

This comparison of the incidence, of natural light and darkness is, in fact, applicable to all of the belligerent countries of northern Europe. Practically the entire industrial districts of Great Britain, France and Germany are contained between 45 deg North and 55 deg North. In the United States the entire area from the latitude of Boston-Detroit-Milwaukee, to the latitude of New Orleans is contained between 30 deg North and 43 deg North. Whatever the effects may be, there seems to be little doubt that these differences in the distribution of natural light are substantial.

There is another characteristic difference between American and European, particularly British, conditions that has been generally observed and commonly understood by everyone with any familiarity with both regions. This consists of the marked differences in the existing types of building construction due, in part, to differences of method, and in part to the preservation in service of ancient structures, or the contrary tendency in most of America. It works both ways, but the differences are great and reasonably may be calculated to have a proportionate effect upon either friendly or hostile estimates of the probable success of air raids. A very large proportion of all public and commercial buildings in America, such as those ordinarily found in the business centers of cities, are of superior fire-resistive types of construction, with steel structural frames and non-bearing walls. Such buildings are very well protected from fire and have been estimated by experts to be as nearly immune to the effects of explosives as any structure may be, indeed, the experiences of such types of construction in London confirms this view. But in a city such as London, there are not only many buildings that are actually ancient, but a very large number, used and useful for public or commercial purposes, of out-moded non-fire resisting construction with load-bearing walls and timber frames. The record, as to fire and demolition, is already unhappy history.

On the other hand the typical dwelling house construction in England is of stone or brick with very extensive use of slates for roofing. While these dwellings were probably not deliberately intended to be fire-retarding, comparison of their sturdiness with characteristic American dwelling house construction recalls the mid-Victorian gibe at America as a "land of paper money and wooden houses." If there is any special vulnerability in America it may well consist of these miles of shingle-roofed wooden dwellings.

With respect to industrial construction there is perhaps no reliable comparison. No doubt much of the European construction is of the newest and best types, moreover it has probably been designed with the present contingency in view. Perhaps the odds should be a little in favor of American structures, at least as far as direct munitions plants are concerned, for most of these are very recent, in fact they are as new as the production effort, which is very new indeed. Some of them are not yet built.

The problem of traffic control is related quite directly to blackouts, or the presence or absence of whatever lighting may be provided for that contingency, and in this case also there are marked differences between European and American conditions. In 1939 there were 19 people to every passenger car in the United Kingdom, 17 in France, and 41 in Germany, whereas in the United States there was one car for each four of population. These figures indicate ratios of traffic density for these countries compared with America, of the following round numbers: America, 100; France, 24; United Kingdom 21, and Germany, 10. As everyone knows, the disparities are actually much greater than these ratios indicate. It is sufficient to observe that blackouts accompanied by movements of traffic do result in a formidable increase in traffic accidents, according to English experience to a degree that has led to comparison with the toll of the air raids themselves. Experience in American cities, even under the relatively easy condition of practice and short blackouts, confirms the serious nature of the hazard.

Perhaps enough has been said to establish the view that the execution of blackouts is more of a problem than merely following the record of British experience however valuable that may be as a guide, perhaps as particularly in what not to do as for what to do. Certainly all persons charged with the responsibility of establishing the measures to be taken should give full consideration to the basic conditions that may be different. Unfortunately, the local officials who actually ordain and carry out the measures that affect their own people locally, may not always be in a position, or may be disinclined due to popular clamor, to appraise the situation in this fundamental manner.

Fortunately, two recent events tend toward a clarification of the general problem in a way to take full account of American local conditions. Mr. James M. Landis, Director of the OCD, speaking at a luncheon in New York this month, made it clear that general and prolonged blackouts were not contemplated, that munitions plants are expected to carry on, presumably with adequate inside lighting, even during alarms, and that the blackout of external lighting, when and where practiced, should be black; that is to say, the method of complete extinction of externally visible light should be practiced during an alarm, and for its duration. This program, if followed by clear directives to local authorities, should do much to clear up any existing uncertainties.

The second event was valuable because it represented an actual military solution of an actual war problem. It appears that there had been reason to ascribe certain of the ship losses in coastal waters by submarines, to the visibility of the victims provided by civilian lighting along the shore, in particular to such great amounts of lighting at places like Atlantic City or other resorts. Here was a situation comprising actual enemy action on a more or less continuous scale, a technical hazard to friendly shipping, and a remedy, which is understood to consist of the complete and continuous extinction of all light visible from the sea. These measures will not eliminate submarine sinkings of course, since many of these occur at other places and times, but it will be profitable to observe whether night sinkings in these particular places are abated, by removal of the special facilities unwittingly provided for the enemy.

We in America appear to be assured of adequate technical treatment of whatever form the problem may take. All that remains is to insure that the problem shall be dealt with in full knowledge of the special requirements of the American situation, and not from a more or less romantic disposition merely to imitate what has been done elsewhere.

Salvage and Reclamation Operations of Utilities in the War Program

SECOND CONFERENCE, ST. LOUIS, MARCH 16, 1942

THE second of the series of conferences on reclamation, salvage and scrap sponsored by the Purchasing, Stores and Transportation Committee of the Institute was held at Hotel Jefferson, St. Louis, Missouri, on March 16. Mr. W. P. McArdle, Chairman of the committee, presided and Mr. George Sutherland of the Bureau of Industrial Conservation, Washington, D. C., was the guest speaker. Forty-three persons attended the meeting, representing 35 companies in seventeen middle western states.

At the morning session a symposium of present practices in salvage and reclamation of materials and disposal of scrap was presented by representatives of a number of utility companies.

These papers, some of which are abstracted in this issue, were presented in informal style and the meeting was then thrown open to general discussion at which all delegates participated.

Mr. Sutherland said it was apparent from the presentations and discussions at the meeting that the utility companies were conscious of the urgency of the situation and that real groundwork had been established in the salvage and conservation program. He also emphasized the importance of all possible re-use of materials, thereby reducing the demands on the manufacturer or fabricator of new materials, but stressed the fact that there was urgent need for all kinds of scrap materials and that all companies should make a thorough review of their materials and stocks toward disposing of all equipment for which they did not have immediate need.

Mr. Sutherland urged that company officials put into effect a few simple procedures, such as (1) that one individual in each company be responsible for salvage operations to assist in expediting the flow of scrap, and that each department or each plant have someone responsible for salvage operations—(2) that some effort be made to give every employee in each company some idea of the salvage program, either by means of posters, meetings or any other means of accomplishing this end—(3) that the program be "carried on" because there is urgent need for scrap, not only right now, but there will no doubt be a need for it in 1943—(4) that the necessary machinery be set up so that periodic reporting of receipts, deliveries and inventory of scrap material is possible—(5) that the name of the dealer to whom scrap is sold be recorded if for no other reason than a protection to the utility.

It was explained by Mr. Sutherland that reported information was needed to get some idea of the progress of the program and that the name of the scrap dealer to whom scrap was sold was necessary so that the information might be passed on to the commodity men who have the job of following up the dealers and the scrap after it has left the utilities' yards.

Mr. Sutherland explained that while he appreciated the fact that all of this meant additional work, he knew that with the cooperation of the utilities much could be accomplished. He quoted several letters setting forth what had been accomplished by companies which originally had been under the impression that they had no scrap and would not be in a position to cooperate, finding upon investigation, however, that several score tons of iron, steel, copper and other critical materials had been in their possession unknowingly.

UTILITY SCRAP AND SALVAGE HANDLING IN AN AREA OF LOW POPULATION DENSITY

By H. E. Hodgson

General Storekeeper, Wisconsin Power and Light Company, Madison, Wis.

OUR company has always had a scrap and salvaging policy. Today, however, we recognize more than ever before, the need to bend every effort toward the conservation of all materials. We fully realize that our nation is engaged in an effort to out-produce our adversaries in war who have had years of head start. Lean, saving, frugal, "have not" nations whose ideas of utilizing materials, cast off by us as low value scrap, have paid them enormous dividends—so far. Nations to whom a freighter load of miscellaneous scrap iron is as important as days of output of one of our mines is to us. In contrast our country has been a "have everything" nation. Wasteful, fat and self-satisfied with the result that, so far, we are reaping just what we have sown. Our nation's task now is to do in twelve months what our adversaries have taken years to accomplish. We are confident that this can and will be done and that utility companies can, in no small way, aid in this effort. We have all been guilty of counting costs too closely in the past. Too prone to say "we can't get enough out of it to bother". Many cities have filled acres of low land in the last fifteen years with material now considered to be vitally important to carrying on the war. This picture is changing and out of this change, utility companies will benefit financially and at the same time play an important part in the immediate war effort as well as help in the general program of conservation in years to come.

The Wisconsin Power and Light Company operates in an area comprising approximately 13,000 sq. miles serving some 300 communities having a total population of about 550,000. The population served with electricity at retail is about 265,000 or an average of some 20 per square mile. In the area served there are only five communities exceeding 10,000 population, the largest of which is about 40,000. We have twelve to thirteen hundred employees or an average of about one for every 10 square miles of territory served.

Our primary problem was and is to make every employee "salvage con-

scious". Various means of accomplishing this have been used. Bulletins have been issued from general headquarters and direct appeals made by divisional operating executives. Employees are urged to conserve on the use of new materials by reusing everything possible from heavy equipment down to carbon paper, paper clips and pins. Shipments of operating supplies, even though available at the moment, are being withheld or furnished in restricted quantities to forcefully bring home to every employee that shortages exist. Our aim is to have not one employee alone responsible for salvage but to enlist the entire personnel in the movement to save everything salvageable no matter how small the quantity and even though the relative value is small compared to the cost of handling. Scrap of all kinds is accumulated under the control of storekeepers in 19 district headquarters. They are held responsible for the storing and reporting of it for sale.

In 1941, our company established a complete, revised operating and accounting procedure for the handling of salvage, thereby creating a sound foundation upon which to build a program best adapted to our far-flung territory. Every foreman is responsible to his superior for returning to storerooms, all material or equipment remaining from construction, rebuilding, retirements or repair work and it is insisted that there be a thorough cleanup on every job. An immediate accounting is demanded.

When such accumulations are turned into storerooms, they are gone over piece by piece and storekeepers, with the guidance of operating supervisors, classify it into (1) reusable material, (2) materials questionable as to standard, (3) material that can be reconditioned or (4) scrap. The disposition of equipment or material questionable as to standard is decided upon at general headquarters upon recommendation of the operating head or chief engineer. Equipment or material that can be reconditioned is accepted into stores and remains under stores control, but is delivered to local departmental shops for the work of reconditioning. Conductor is spliced and recoiled, bolts rethreaded, bolts and braces straightened, crossarms reconditioned, meter parts salvaged, minor and occasionally major repairs made to equipment.

A central record at general headquarters is maintained for all surplus by a requisition supervisor, over whose desk all requisitions pass so that it is possible to apply such surplus at points of need.

All scrap gathered is classified as accumulated and carried in a special subdivision of our stores account at prices as near as possible to market value. Such accumulations are periodically reported to general headquarters and sold under the direction of the Purchasing Agent. Sales are, for the most part, made to local buyers at the point of accumulation.

Special emphasis is being placed now on the need to check over the entire system and in a general housekeeping movement, locate and get into our scrap piles all heretofore overlooked salvageable items. Just recently one of our storekeepers noticed in his own building, a converted manufacturing plant, a partially wrecked cast iron assembly line track. This resulted in the reclaiming of some 14 tons of cast iron otherwise lost to the raw material market. It's needless to say that we, incidentally, can use the $200. Idle equipment previously held for sale as units and idle equipment held for possible use on our own system is being carefully scrutinized to determine the desirability of consigning it to scrap.

Our system is effective now. We expect it to become more effective as our promotional program progresses.

Consideration was given to a central point for salvage and reclamation but elements of transportation, personnel and warehousing convinced us that we could most economically carry on our program with a decentralized system in our widespread territory utilizing our entire personnel in this beneficial work.

Methods are a matter of opinion and are designed to fit a particular need. The important thing to remember is that the utility industry, which leads in the program of discarding the old and accepting the new, must take an active and influential part in directing discarded materials back into raw material channels.

A CHALLENGE TO THE INDUSTRY

By M. B. Covell

Supt., Power Supply, Union Electric Company of Missouri, St. Louis, Mo.

WITH our country at war the problem of reclamation and salvage takes on an entirely new aspect. It presents a challenge to the industry to bring to bear all the enterprise we have to contribute the maximum on our part toward a quick conclusion. In approaching this job there are two most important things which we must first recognize. First, there must be a complete reappraisal of everything we have done in the past. Nothing can be taken for granted under present conditions. Secondly, and most important, this job requires a fundamental change in viewpoint.

We have all been accustomed to operating on a dollar economy. Every decision was predicated on cost and we as a country were extremely prodigal with materials. We now must approach our problems on what we might well call a material economy. Cost is secondary. The all important question should be, "How well do we utilize material which is essential to the war effort?" This new view presents a double challenge because, after all, none of us can disregard costs or other operating considerations entirely. These should nevertheless be recognized in their true relation to the more important use of essential materials.

Our country's activity embraces the distribution of power, both steam and water power generated, gas, steam heating, the operation of a short line railroad used largely for transportation of coal and the operation of a mine. There are two persons in the organization whose sole function concerns salvage and reclamation operations. A salvage engineer is attached to the Stores Department, whose job it is to see that the company takes full advantage of materials and equipment which become slow-moving, otherwise obsolete, or ready for the discard. A salvage salesman is attached to the Purchasing Department, whose job it is to sell all scrap and surplus material and equipment.

The procedure which operates in the Stores Department is the first and most important step in the full utilization of such material. All removal work orders clear through the salvage engineer. This gives him an opportunity to learn in advance what is about to be removed from property, and as soon as he learns about it, many times long before removal, he arranges to go over all the material items with those individuals who have

charge of that part of the property to effect a rough division between reusable materials, equipment, and scrap. He then arranges to have the materials either transferred into the Salvage Division for reworking or into the Salvage Stock to be held for further disposition.

Further than this, the salvage engineer by means of the budget and work order system learns of all new construction work which is under consideration. This enables him to be constantly on the alert to make suggestions to construction and operating engineers for consideration of surplus equipment. He further reviews all requisitions for new material coming into the Stores Department. Both salvage engineer and salvage salesman travel over the property constantly so as to keep well informed concerning the existence of equipment and materials which may fall into the surplus category. These two individuals work particularly close together on materials and equipment which is held in salvage stock because it is here that we find the broadest border-line area where it is difficult to quickly determine the relative saleability or reuseability.

It is here that we are exerting our greatest efforts today to reduce the *time element* and avoid having essential materials tied up in what all too often in the past has been *dead storage* waiting for a *profitable dollar use*. As part and parcel of this approach, our salvage engineer has recently conducted extensive field surveys with all of the operating departments, involving all of our plants and stations, to unearth materials and equipment which are still a part of property but which may well under existing conditions *be considered* for withdrawal to salvage.

We have for many years conducted salvage operations which are familiar to all utilities and which warrant little comment. Line hardware and specialties are reworked, repaired, and reused. Weatherproof wire is respliced for reuse where in good condition. We have during the past year or two reimpregnated with U R C compound wire on which the insulation was in fair condition. The lead is stripped from cables, the insulation burned off, and the copper cut up for marketing. Since the very beginning of the defense program, our company has recognized the desirability of moving these critical materials to the market as rapidly as possible. We have been selling in such a way as to permit no large accumulations.

We are presently cutting out the wiped sections of cable joints in an effort to reclaim the solder. Likewise, we have been removing a fair amount of older cables in which it was not uncommon to use tin alloy sheaths. We make checks on every lot of such cable that comes in in order to take full advantage of the tin that may be in the sheath. Frequently the content is low, 6/10 to ¾ of 1 per cent, and it is impossible for a refinery to remove it as such. Nevertheless, the refiner can recover the tin by adding more tin to produce other tin bearing alloys, so long as the lot is large enough to work into normal production.

In addition to cable joints, we are salvaging babbit from all bearings that come in, either used bearings that are scrapped or bearings removed from machines it has been decided to scrap, in order to recover the tin content. We likewise are utilizing these salvage materials to carry on some experimentation in connection with substitute solders as our operating engineers recognize that before many months we very likely will be faced with the necessity for accepting such substitutes for many uses.

Next to the activity in non-ferrous metals, we as an industry can probably contribute more to the reclamation of iron, steel, and other ferrous alloys. Our company maintains a regular program of iron and steel scrap collection by means of bins located at each power plant, storeroom, and garage, together with the mine and railroad yards. This material is sorted as it is collected to remove such items as can be more readily utilized if sold separately. While in normal times we could not afford to separate many of the ferrous alloy metals of the type which are regularly accumulated from the coal mills and ash handling equipment, we have for many months been handling chromium, manganese, and nickel alloys separately. In a great many cases these old parts are not sold through the usual channels of trade but rather back to the original producer for, with his close metallurgical control on production, he can utilize them more expediently and with less cost than if put into the ordinary secondary markets. He knows limitations and values of such scrap. All of this material like copper and lead is being sold just as rapidly as accumulated in economical lots, carloads or truckloads.

In common with many other utilities, we collect all of our waste paper for salvage. This, together with rags and rope, is centralized at our main storeroom where it is prepared for delivery and sold. We have extended this activity during the past few months in outlying territorities where during normal times the cost of handling could not possibly be warranted. In such situations we contribute to the Boy Scouts, etc. We are likewise extending our salvaging of rubber by experimentation with the removal of rubber insulation from wire which has not heretofore been considered economical. We have recently opened discussions with some of the wire manufacturers who are studying the problem to determine whether, where the grade of insulation is known, the material can be more effectively reprocessed by the original supplier.

We have increased our activity materially in connection with abandoned or written-off properties where various departments involved have simply not gotten around to the job of disposal. Many times such delay is quite proper when one is looking at the problem solely from the standpoint of overall cost. But today the element of time is so all important that we must of necessity make decisions without regard to what the hind sight may bring forth a year or two from now. Equipment which has been left in place on the off chance that a buyer might be found or with a view toward dismantling at a more opportune time with surplus labor is being reappraised.

The present second hand markets as everyone knows are extremely active and the WPB has often voiced the desirability of getting such equipment into use or into scrap. We must, I believe, constantly recognize the tremendous importance of time, and certainly there seems to be no point to holding a piece of equipment on a slight chance that it might be used when there is such a crying need for iron, steel, and copper in the secondary markets.

A few days ago I read an article in one of the newspapers by a daily columnist on the subject of hoarding around the home. This writer made reference to the fact that if we were honest with ourselves, we must all admit that there is a certain amount of squirrel blood in us. I think that right now we, and particularly our operating engineers, should recognize that some risks must be taken in making such decisions. To hang on to a piece of obsolete equipment when conditions are such that the betting odds are very short that it would ever be used simply to avoid criticism in case such a contingency does arise, is extremely ill advised when the materials could be used to advantage by some one else.

It is not difficult to determine through the large equipment dealers operating nationally just where demands be today. Close contacts along these lines, as well as close contacts with the WPB should enable those individuals, both engineers as well as material men, to reach such decisions on a realistic basis.

As an example of this, our company has recently decided to place on the second hand market a substantial dollar volume of transformers. These units have been carried in active stock, never having been released to surplus for the simple reason that the sizes and voltage classifications were standard with the company for certain parts of the system which are still in operation. We are continually requiring transformers in this voltage classification. We do know, however, that there is an active demand on the market for such units and, on a realistic reappraisal of our own needs, we have concluded that the chances of our having to come back into the market for any of these particular ratings within the reasonable future are slim. I don't say they are non-existent. I repeat they are slim. I don't think anyone will be criticized if we find we do have to repurchase a few within the group.

We have a similar situation affecting one particular class of meters, a class for which we have some demand but which, due to changes and removals on the system, is out of proportion to our possible need for such units. We have simply concluded that we shall gamble our ability to maintain essential services if we find that we need to buy more of these ratings. We are offering a substantial portion for sale to meet an active demand and because everything which goes into a meter is critical, and furthermore because the demand for manufacturing facilities in that field to be used on the war effort is very great.

To sum up, I can only repeat what I said at the outset, that we must need to accept nothing in our past experience as today's criterion. We need to reappraise our every action realistically in light of existing conditions. We need always to keep before us the fundamental viewpoint that our economy for the duration is to be a material economy and not a dollar economy. We are all part of a team, both individuals within the company and companies within the industry. Our decisions and the decisions of everyone in the organization clear down the line must not let individual viewpoints outweigh the fundamentals. The present is no time to take the safe out for our individual skins by making decisions that may avoid criticism later on or may save a few pennies for our companies at the expense of what the nation needs so sorely. Mr. Krug recently said, "We are at war and we can't run with unused reserves. We must utilize everything we have and under these circumstances it is just too much to expect that there will not be dislocations." Our every effort is needed to reach this goal. Our engineers will need to weigh their every decision in the cold blooded light of how the action ties into the war effort and not how can we maintain past efficiency, past conveniences, or past standards of service. The situation requires that material men keep in touch with a rapid changing supply and demand. They shall need to revise their ideas almost continuously. What might have been the facts even so much as six months ago, let alone at the bottom of the depression, means nothing today.

SALVAGE AND RECLAMATION OPERATIONS AT INDIANAPOLIS

By T. W. Ayton

Salvage Engineer, Indianapolis Power & Light Company

WE are engaged in mechanized war which requires much metal and it is our job to route into industrial channels at once all available supplies of scrap metal in order to conserve manufacturing man-hours and new material by a more complete salvage and reclamation program.

Our present salvage operations divides itself into the usual department maintenance routine which conserves material and the other part which is devoted to a rehabilitation of removed equipment and the re-use of materials from waste. A condensed outline of our operations is as follows:

Power Plants. Manufacturing man-hours and materials are saved largely through the use of the metalizing process by which worn surfaces and shafts are built up with suitable metal and re-machined to dimension. For example an ash pump shaft costing about $65.00 may be restored to new condition for 20% of that value. A boiler feed pump shaft worth about $200.00 may be restored for approximately 25% of that figure, and the shaft of a clinker grinder costing about $85.00 may be restored for 15% of the original cost. These figures are approximate and are largely labor costs.

Another item in the plant department is the repair of Foster-Wheeler economizer tubes costing $50.00 each which are repaired for about $15.00. This repair is accomplished by cutting off the ends of the used tube, welding on a pipe extension over which is placed a machined casting with cooling fins to restore the tube to its original length and usefulness. Quite often pump impellers are repaired by metalizing or building up worn parts by the welding process.

Electrical Distribution Materials and Equipment. All line hardware such as braces, brackets, racks, mast arms, anchor rods, guy guards and similar material removed from the line are cleared through a central headquarters where they are classified into three general groups: 1. Material in condition for re-stocking. 2. Material requiring work, new parts or regalvanizing prior to its return to stock. 3. As junk (melting steel).

Wire and Cable. This material is inspected and all usable items are spliced if necessary and returned to stock. The balance is reduced to scrap copper, lead, lead sleeves, etc., and then placed in stock pending disposal.

Guy wire which is in suitable condition as to length and is "made up" is held for reuse. Strain insulators and guy clamps are removed from the balance. Pieces of wire 18" long or less are placed in melting steel scrap and other rejected wire is placed with baling scrap steel.

Poles and Crossarms. These wood products are inspected and re-worked, and the usable material placed back in stock in the same or reduced size. Reclaimed poles unfit for re-use as such, or as stubs or as anchor slugs are set aside for fire wood. Broken metal ornamental lamp standards are repaired by welding and sheet steel re-rolled when possible.

Electrical Equipment. Transformers of all sizes and types are received at a central headquarters where they are cleaned, inspected and repaired prior to restocking. All rewinding is done by outside service shops. Regulators, protective equipment, disconnects, oil switches and similar equipment are inspected, repaired, and tested prior to restocking.

Lugs, Connectors and Fittings. All solderless lugs, connectors, switch parts and other similar items are chemically cleaned and given a treatment of "bright-dip" prior to restocking or re-installation. Usable condulets and switchboard fittings as well as insulators and bus copper are processed prior to stocking or re-use.

Transil Oil. Arrangements are now being made to process insulating oils in addition to the usual blotter press and centrifuge routine.

Mechanical. Pipe in good usable condition

(*Continued on page* 110)

Utilization Voltages*

By Howard P. Seelye

Senior Engineer, The Detroit Edison, Past Chairman, Transmission and Distribution Committee, EEI.

UTILIZATION voltage is usually thought of in terms of the voltage rating of the lamps used, or of a nominal standard voltage announced by the company rendering service. It is probably quite generally understood that the voltage actually appearing at the outlets to which lamps or appliances are connected varies somewhat from time to time. What is not so well recognized, however, is the fact that the voltages delivered at customers' outlets on any power system are normally distributed in a characteristic pattern through a band of voltage of considerable width. It is the purpose of this paper to point out that this voltage band or spread is an inherent characteristic of the system, to discuss its source and its nature, and to indicate the connection between it and the design and rating of utilization equipment.

The voltage which will be treated in this discussion is the "utilization voltage" as distinguished from "service voltage." That is, it is the voltage appearing at wall outlets and lamp sockets rather than that which the utility supplies at the service entrance to the building. The difference between these voltages is the voltage drop in the building wiring, which is an appreciable amount, as will be shown.

While utilization equipment is built for various voltage classes, the major portion is applied at voltages in the 120-volt group. Attention will be given to these first, therefore, but mention will be made later of the special problems encountered with the higher voltages.

Voltage Spread

It would be preferable if the general conception of utilization voltage could be that of a band or spread of voltages between defined limits, rather than as a single voltage such as 115 volts or 120 volts. It is, of course, commonly accepted that a piece of commercial utilization equipment may be called upon to operate at other voltages than the rating stamped on its nameplate. There seems to be a tendency, however, to consider such variations as deviations from a normal voltage rather than as themselves normal voltages within a normal voltage band. It should be clearly understood that on any ordinary distribution system such a voltage spread is inherent in its operation. At heavy load periods, the voltage delivered at customers' outlets will, of necessity, be distributed throughout a band which is rarely less than 6 or 8 volts where close regulation is feasible, and may be as wide as 15 volts in some areas.

With reference to utilization equipment, this means that the equipment is expected to operate satisfactorily to the users through this band of voltage on any individual system, and through a still wider spread of voltage in general when the variations between systems is taken into account. Only a part of this equipment will actually operate regularly at its rated voltage, the rest being used at voltages ranging from the lowest to the highest limits of the spread. It follows, therefore, that, in the design of such equipment, the emphasis must be placed as far as possible on having good operating characteristics over a specified band of voltage rather than at some one voltage. In order that this voltage band be so placed as to be most advantageous to the users, it is essential that a generally accepted standard voltage spread for the industry be fixed and defined.

A considerable amount of work has been done by the Transmission and Distribution Committee and the Electrical Equipment Committee of the Edison Electric Institute during the past few years toward the establishment of standards of utilization voltage, particularly this voltage spread for satisfactory operation. Surveys were made of 45 operating companies to obtain data in regard to the actual operating voltages in use. The data from these surveys, and other information on this subject which has been presented to these Committees, have been made available to the author for use in the following discussion.

The reasons for the normal voltage spread will first be described. The numerical order of existing spreads and their limits, and the standards which have been proposed, will then be discussed. Following that, there will be pointed out, for some of the commoner types of equipment, the conditions of operation to which weight should be given in choosing their "best voltage."

Causes of Voltage Spread

There are, in general, three causes for the existence of a "spread" in utilization voltage. The first two pertain to the variation between different power systems throughout the country. The third is responsible for the deviations in any one system or circuit. All three should be given careful consideration in setting a voltage standard or an apparatus rating.

1. *Lamp Voltage Ratings.*

It is well known, of course, that lamps are made in several standard voltage ratings, 110, 115, 120, 125, 130 volts, etc. These and an even greater variety of ratings came into existence in the early growth of the industry. At first this was largely on account of the inability of the makers of carbon lamps to standardize their product to definite voltage ratings. Later, as manufacturing control improved, it was continued on account of the same sort of voltage spread on operating systems which is being discussed here. As time went on there was a tendency toward concentration on a few definite ratings. This was facilitated by the fact that the negative resistance characteristics of tungsten lamps permitted a lamp to be used satisfactorily through a wider spread of applied voltage than was allowable with the positive characteristics of carbon lamps. Fig. 1 shows how the lamp sales have varied in proportion to voltage rating since 1915. It is of interest that, whereas 115-volt lamps were in the majority from 1920 to 1930, they are now only 30 per cent of the total, while 120-volt lamps now constitute 65 per cent. 110-volt lamps have become a negligible factor. 125-volt and 130-volt lamps are still insignificant, being more or less special. It is evident, however, that there are a sufficient number of both 115 and 120-volt lamps in use to account for a spread of voltage between different systems which use them, even if the other ratings are not considered.

The shift from 115 to 120-volt lamps has been due to several causes, among them the desire to gain the advantages

* Paper based on investigations of Transmission and Distribution Committee and Electrical Equipment Committee, EEI. Originally presented at A.I.E.E. Winter Convention, New York, Jan. 26-30, 1942.

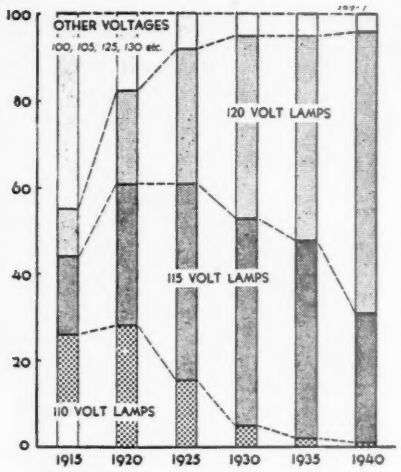


Fig. 1—Proportion of incandescent lamp sales, according to voltage rating

of higher voltage in distribution and the introduction in recent years of the 120/208-volt, 3-phase, 4-wire, secondary network. Motor ratings have remained at 110 volts until recently when the standard for single-phase motors has been raised to 115 volts in the N.E.M.A. Standards and in the proposed revision of A.S.A. Standard C50. Other utilization appliances have been variously rated at voltages from 110 to 120.

It is believed desirable to discourage a future repetition of this shift in voltage preference to an eventual predominance of one of the higher voltage lamps. There is now considerable confusion in the ratings and applications of both lamps and appliances. A continued rise in lamp voltages would add to the confusion, particularly in regard to the appliances. These must attempt to cover the whole field of voltages in use but cannot follow changes so readily, their useful life being much longer than that of lamps. The establishment of a standard voltage spread would tend to restrict further extension of that spread upward, unless the advantages were to become obvious and generally acceptable.

2. *Relation of Rating to Outlet Voltage.*

In addition to the differences in lamp (and system) voltage ratings, there exists in the industry well founded differences of opinion in regard to the relation which the utilization voltage should bear to the rating of the lamp used. Fig. 2 shows the characteristic variation in lamp lumens, energy consumption, and lamp life with variation in applied voltage. Some operators prefer to have the lamps operate as nearly as possible at their voltage rating. Others believe that the increased life resulting from voltages a little under rating is of more practicable value than the higher illumination, and shorter life which results from operation at rated voltage or higher. Others take the opposite view, that the increased lumens per watt at over-voltage operation is preferable. The question is basically one of economy, involving the relation between the cost of lamps and the cost of electrical energy. It must be considered, however, that the nuisance of too frequent lamp replacement may outweigh economy in the minds of the general run of customers.

These preferences must, of course, take into account the inherent voltage spread that exists on every system, which will be discussed in detail later. Where, for example, there is a 10 per cent total spread, and this is not uncommon, there will be some customers, even though a small proportion of the total, getting 5 per cent above the average. If this "average" is held at lamp rating, say 120 volts, these high customers will be getting 126 volts with a lamp life of 55 per cent. If the average is above rating, say 124 volts, the high customers will be getting 130 volts, with lamp life at 37 per cent. The performance of ordinary appliances, such as toasters, waffle irons, and the like, at such voltages must also be considered. Of course, where a smaller spread such as 6 per cent is feasible, an average of 124 would result in a high of only 127.6.

On the other hand, if the average voltage is low, the customers at the bottom of the spread may be getting inferior illumination and indifferent operation of appliances. It will not be attempted here to state the proper relation between rating and average operating voltage. It is merely pointed out that the voltage spread, including the top and bottom limits, should be taken in account as well as the midpoint or average. The differences in opinion in regard to this relation of lamp rating to voltage leads to a voltage difference even between systems using the same lamp rating. One such system will carry its voltage spread at a higher level than will another.

A confusion in system ratings also results from this source, since these ratings are generally 115-volt or 120-volt, according to the lamp rating used. Some so-called 115-volt systems, with average of outlet voltages above the lamp rating, actually have practically the same voltage spread and at the same voltage level as other systems normally designated at 120 volts but having average outlet voltages below the lamp rating. System rating is, therefore, not a definite indication of the existing utilization voltage.

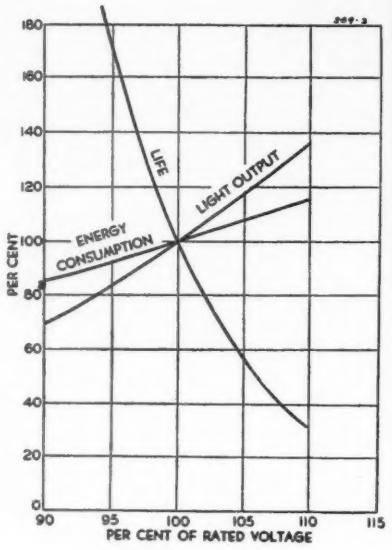


Fig. 2—Variations in incandescent lamp characteristics with voltage

3. *Inherent Voltage Spread in Distribution System.*

The normal, inherent spread of utilization voltage on an operating system is probably the least understood of the three causes of voltage deviation. Its basis is simple, lying in the elementary fact that when electric current passes over a wire, there is a corresponding drop in voltage. The energy delivered to customers on a power system passes over many miles of wire in

(a) Transmission.
(b) Step-up and step-down transformers.
(c) Distribution circuit feeders and primaries.
(d) Distribution transformers.
(e) Distribution secondaries and service drops.
(f) Customer's house wiring.

The voltage drop in transmission is usually controlled to considerable extent by variation of generator voltage, transformer taps, and regulators. Since any of these can regulate in bulk only at one point, there will be a variation in the voltage between that regulating point and other points on the system at which load is supplied. This variation can be compensated for at the substation by voltage regulators on the substation bus or on individual distribution circuit feeders.

These substation regulators, and supplementary regulators and boosters out on the circuits, can also compensate for *part* of the drop in the outgoing distribution circuits. A fairly constant

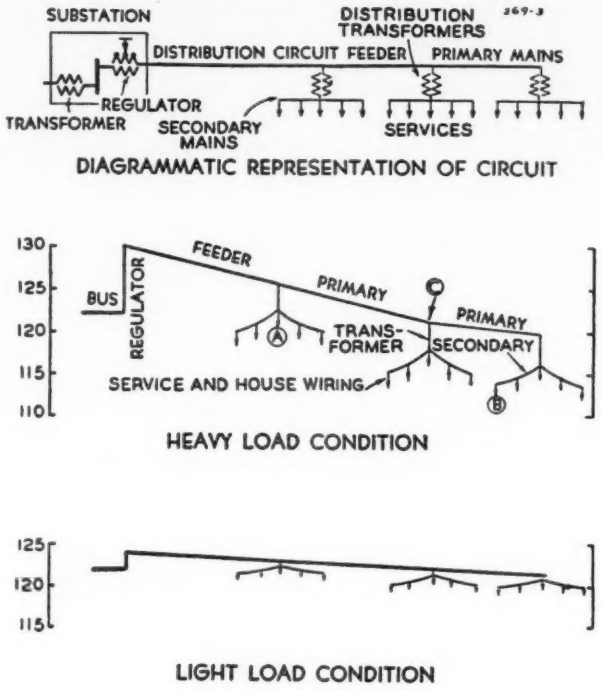


Fig. 3—Diagrammatic illustration of voltage spread on a typical distribution circuit

voltage can be held at *some point* out on such a circuit. Since the circuit may consist of several miles of line, however, it is impossible to have the voltage constant at all points. Some customers will be connected near the regulated point and some far from it. Some will be connected through heavily loaded distribution transformers and some through transformers only lightly loaded. The impedance of the transformers themselves will vary with size, type, and make. Some customers on a secondary main will be near the transformer and some will be at the end of long secondaries. Fig. 3 is a schematic diagram indicating these conditions. The result is that, even though the voltage at the circuit feeding point is held practically constant throughout the day and night, utilization voltage at the customer's outlets will vary through a band which is of appreciable width.

In Fig. 3 the station bus is, for convenience, assumed constant at 122 volts at all loads. The circuit regulator is compensated to hold 122 volts at an intermediate point on the primary mains, indicated by the middle distribution transformer (C). The voltage drops indicated for primaries, transformers, secondaries, and service and house wiring are typical, rather than extreme cases, of those in ordinary practice. It is evident that customers' outlet voltages at time of heavy load will be distributed through a band whose maximum is about 122 volts at customer (A), and whose minimum is something like 112 volts at customer (B). At light load periods, the voltages lie in a much narrower band, of perhaps 119 to 121, while at 0 load, which seldom occurs, all would be 122, the voltage at the regulating point (C).

There are many sorts of distribution circuits, ranging from those in concentrated urban areas where the distances are short and regulation can be reasonably close, to rural lines with long distances and correspondingly poorer regulation. In many of the latter, the desirability and practicability of giving reasonably good regulation, similar to that in more densely built suburban territory, is recognized, but, on the other hand, there are others where regulating equipment is omitted in the interest of lower first cost. Also, there are various types of circuits, such as networks, ring main, and feeder and branch. In any case, however, there will be an unavoidable spread in the delivered utilization voltage similar to that indicated in Fig. 3. It may, of course, be considerably less in some areas than the amount shown here, (networks for example); and in others it will be greater. It will be located at several different voltage levels on different systems.

A survey of 14 companies made by the Transmission and Distribution Committee, E.E.I., produced results which shed some light on the magnitude of the various elements in this voltage spread. The figures in Table I show the range of values reported.

Pattern of Voltage Spread

The outlet voltages on a system are, of course, not distributed uniformly over the voltage spread. The pattern of this distribution is shown on Fig. 4. The blocked graphs were obtained from a sampling survey on a large diversified system. While the urban graph is somewhat different from the suburban, their general shape is similar as shown by the smooth, generalized curves. This pattern has been confirmed in essentials by data from several companies and is believed to be typical.

It is evident that comparatively few customers get either the highest or the lowest voltage in the spread, but on the other hand, there are appreciable numbers getting a volt or two higher than the minimum and a volt or two lower than the maximum. The largest number getting any one voltage is about 27 per cent, in the urban curve, and only about 17 per cent in the suburban.

The average voltage is determined by the shape of the curve and this may vary somewhat between different systems. Field surveys in several companies have shown, however, that the average as in Fig. 4 is near the midpoint, or in some cases even a little higher, up to about 60

TABLE I

	Maximum Voltage Drop, per cent	
	Urban Customers	*Rural Customers*
In primaries	1.3 to 3.5	3.3 to 10.0
In distribution transformers	2.5 to 4.65	2.0 to 4.4
In secondaries	2.0 to 4.5	No secondaries
In service drops	.5 to 1.25	.5 to 1.8
In customer's building wiring	1.0 to 5.0	1.0 to 2.0
Total Utilization Voltage spread	7.5 to 12.0	6.87 to 15

(Since these figures were mostly based on design values rather than field measurements, they should be considered only as indicative.)

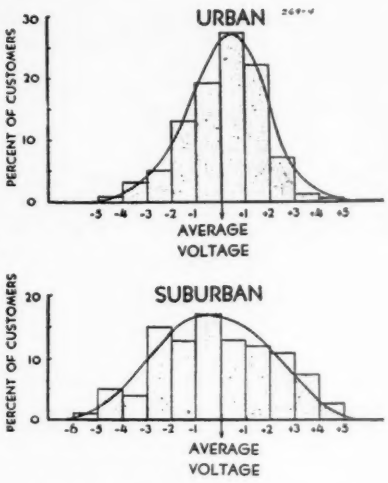


Fig. 4—Distribution of customers' outlet voltage

From actual sampling survey of a large system.

per cent of the spread. This distribution of customers' voltage is useful in considering the range for "best operation" of equipment.

Voltage Spread in Practice

Surveys of the industry in general, made by the E.E.I. Committees, have indicated existing values for voltage spreads and other related quantities. The surveys covered 45 companies, serving approximately ten million residential customers. Since most of these companies did not have available figures on actual field surveys of voltage conditions, design values were reported. Some allowance should perhaps be made for discrepancy between these and voltages which really exist.

No extensive field data on the voltage drop in building wiring is available. Some estimates are given in a preceding table. A sampling survey on the Detroit Edison system covering 300 customers, mostly residential, showed a range from about ½ volt to 5 volts, with an average of about 1¼ volts to lamps in the most-used room under evening load conditions. There are, of course, some part of the outlets which have less drop than these and there will be some cases with more. It is believed that a 3-volt drop will cover the maximum for the great majority of customers.

If 3 volts is added to the spread at service entrance resulting from the survey as listed above the following deductions can be drawn:

1. The maximum voltage spread at *utilization outlets* for the industry as a whole is of the order of 20 volts, from 107 volts (110-3) to 127 volts.
2. This whole spread will not occur ordinarily in any one system but takes account also of the variation between systems which has been previously discussed. It is the spread for which utilization equipment in general must be designed.
3. There will no doubt be some outlets outside of this spread, both above the upper limit and below the lower limit. It is believed, however, that the percentage of these will be very small and that they may be considered as unusual or temporary conditions for which operation of equipment cannot be expected to be as good as it should be within the normal range.
4. The greater bulk of customers have outlet voltages within the band between 110 (113-3) and 125 volts.
5. On individual systems the voltage spread at utilization outlets ranges from 7 volts to 18 volts, with nearly 2/3 lying between 10 and 13 volts, very few above that, and the remaining 1/3 lying between 7 and 9 volts.

It should be clearly understood that these figures refer to voltage spreads existing on systems as a whole and are not intended to refer to the voltage variations at any individual customer. The voltage at such a customer will vary from his voltage at heavy load period to that at light load. Referring to Fig. 3, in the case there represented, the maximum individual variation occurs at the customer with the lowest heavy-load voltage and is equal to nearly the full spread of some 10 volts. The minimum is at the customer with the highest heavy-load voltage and is very small. Referring to the customer distribution curve of Fig. 4, it is evident that few customers have the maximum or minimum variation. Most of them get more nearly the average, which in the case of Fig. 3 would be about 5 volts.

The figures which have been cited leads to a suggestion of a general standard maximum utilization voltage spread of 107 to 127 volts, with a *preferred* spread of 110 to 125 volts. Fig. 5 illustrates how several different typical service conditions can fall within this spread. There are, of course, many other variations which can and will be used on operating systems and still lie within the total proposed spread.

Higher Voltages

The discussion so far has referred only to voltages in the 120-volt group. The same problem exists, however, with the higher utilization voltages, 240, 480, 2400, etc. In the 240-volt group, the complication of the "odd-ratio" system is introduced. Network distribution in dense urban territory is now commonly 4-wire, at 120/208 volts. The voltage supplied to 240-volt equipment on such a system is only 87 per cent of what it would be on a 120/240-volt even-ratio system, with the same voltage for the 120-volt equipment in both cases.

For the most part, the same standard 240-volt equipment has been used satisfactorily on these odd-ratio systems as on those of even ratio. Special 208-volt motors are available, but have not been widely adopted. This practice has been allowable largely because the odd-ratio systems usually are found in densely-loaded areas where service voltage tends to be relatively high and the voltage spread relatively small, making the minimum voltage high enough for 240-volt equipment. There are several advantages in having one standard line of apparatus so designed as to serve both purposes if feasible. Manufacturing and stocking are obviously simpler for one line than for two; interchangeability is provided between locations where service voltage is odd-ratio and locations where it is even-ratio.

In setting up a standard voltage spread for the industry, it is desirable that it be broad enough to be adequate for both even-ratio and odd-ratio systems, and yet not too broad to allow one line of apparatus to cover it. Taking into consideration the probability that the voltage drop to 240-volt equipment would

TABLE II, SERVICE VOLTAGE

(Drop in building wiring should be deducted)

Minimum Service Voltage Reported	110 volts
Maximum Service Voltage Reported	127 volts
Minimum Service voltage for companies serving 77 per cent of the total customers	113 volts
Maximum Service voltage for companies serving 80 per cent of the total customers	125 volts
Voltage spread at service:	
Minimum Reported	4 volts
Maximum Reported	15 volts
Classification of service voltage spreads:	
For companies reporting 33 per cent of total customers	4 to 6 volts
For companies reporting 62 per cent of total customers	7 to 10 volts
For companies reporting 5 per cent of total customers	11 to 15 volts

be somewhat greater than to that at 120 volts, and that the service voltage in general to 208-volt services would be relatively high, a spread of 193 to 250 volts maximum, 197 to 245 volts *preferred* has been recommended.

At the still higher voltages, 480, 600, etc., similar problems of "odd-ratios" are also found, and it is probable that the voltage spreads for these levels should be multiples of those at the 240-volt level.

Equipment Design

One of the most important objectives in trying to establish standard voltage spreads is the simplification of the design and rating of utilization equipment. If the voltage spread which must be met in practice is fixed between reasonable limits, there will be more assurance that equipment which operates satisfactorily within those limits will be generally satisfactory for the industry. Also, as further knowledge is gained of the characteristics of service voltage within those limits, the designs of specific items of apparatus can be more definitely directed toward the actual voltages at which they will most commonly be operated.

This paper has pointed out the fact that a voltage spread of from 7 to 15 volts is a normal condition on an operating system. The utilization equipment supplied should be expected to operate at any voltage throughout that spread, with satisfactory results to the user. If and when a standard spread for the industry, such as that which has been suggested, is generally adopted, it should be expected that equipment sold would operate satisfactorily *throughout* that spread. Since the bulk of the customers will have voltages within a somewhat less spread than the maximum, the preferred voltage spread indicates the range through which *good characteristics* of operation should be maintained. On the other hand, it should be kept in mind that there will be occasional customers on any system where voltage will fall somewhat above or below a recognized spread and their equipment should still operate, even if not with characteristics which would be considered generally satisfactory.

It would be desirable, if practicable, to eliminate all the variety of voltage ratings on different equipment, reducing them to a uniform rating of, perhaps, the nominal 120-volt designation, with the understanding that they would meet the requirements of the standard voltage spread. It is realized that there are difficulties in carrying out such a simplification, one of them being the different

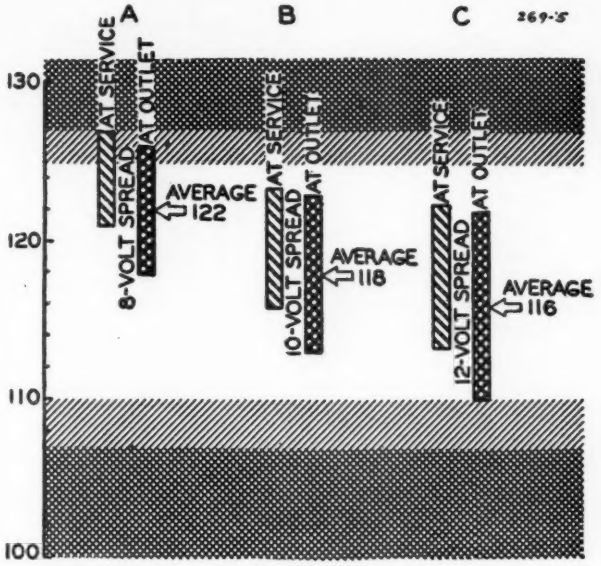


Fig. 5—Typical voltage spreads within the proposed standard
A—Urban service, closely regulated, 120-volt lamps
B—Urban service, general, 120-volt lamps
C—Rural service, 115-volt lamps

ideas which are prevalent concerning the proper relation between lamp rating and average voltage supplied, or in other words, between lamp life and illumination. Another is the probability that all types of equipment are not adaptable to as wide a range of voltage as the spreads proposed. These considerations will probably require the retention of more than one rating for some equipment. Other items, such as motors, are probably already pretty well adapted to such a standard range and could be uniformly rated accordingly.

While it is not the province of this paper to attempt to specify the best voltage for which any piece of equipment shall be designed, some of the considerations which should affect such a choice within a standard voltage spread will be suggested.

Lamps

There is probably a distinct need for both "long life" lamps, and for "high illumination" lamps. The former would be used where efficient illumination was not the prime requirement, such as for low wattage lamps for indicating or ornamental purposes. The design voltage should be high in relation to the voltage spread so that they would be operated at under-voltage most of the time. "Long life" lamps in larger sizes would also be preferred for general use by some operators. For this purpose, however, the design should give somewhat more regard to illumination and less to extreme length of life. "High illumination" lamps would have a demand where illumination intensity was closely measured and the application was strictly on a "lumens-per-dollar" basis. The design voltage should be nearer the middle of the spread or below it, giving "normal" voltage or "over-voltage" operation to the majority of lamps.

Fluorescent Lamps

A recent publication states, "The lamps with 'low' voltage ballast equipment are designed for operation on circuit voltages of from 110 to 125 volts inclusive, and in some cases may operate satisfactorily on circuits as low as 105 or as high as 130 volts."

These figures correspond well with those of the proposed standard voltage spread.

Electric Range Elements

Ordinarily the voltage drop to a major appliance, such as a range, will be fairly large due to the current it draws. Much of its operation will be during hours which are off-peak for the lighting load, but it will also have to operate on peak. Its maximum, will, therefore be several volts lower than the top of the voltage spread and its minimum near the bottom of it. The suggested standards, published in 1938 by a Joint E.E.I.-N.E.M.A. Committee have a "Preferred

(*Continued on page* 112)

Industrial Health

By C. O. Sappington, M.D., Dr. P.H.
Consultant, Chicago, Illinois

One of a Series of Articles Sponsored By the Accident Prevention Committee of the Edison Electric Institute

INDUSTRIAL health is a cooperative undertaking. This means that many different types and groups of people are interested in and concerned with it, including the employer and employee, research worker, physician, safety and industrial hygiene engineer, mentioning also the insurance company, the lawyer, director of personnel and labor relations, public relations personnel, the nurse, psychologist and psychiatrist. At the outset, it is advisable to discuss the scope of industrial health work and the meaning of the terminology used in connection with industrial health problems.

Industrial health is a broad term and obviously includes all methods and practices aimed at the supervision and maintenance of a high level of personal health among industrial workers. The complexity of the field is thus obvious, particularly when it is realized that any factor which may adversely affect health becomes a problem for concern and investigation. In the very beginning, it should be noted that the essence of industrial health lies in the *prevention* of trouble. This conception necessarily broadens the field of approach and application of industrial health procedures.

A distinction should be made between the general practice of industrial health and the general practice of industrial medicine and surgery. This distinction has already been made in practice in most instances. By and large, the practice of industrial medicine and surgery is limited to the diagnosis and treatment of disease and injuries. This, of course, is entirely the responsiblity of the physician and in most instances, the physician is mainly occupied with curative procedures. There is, however, what is called preventive medicine in industry. This directly applies to industrial health work, and in it the physician is used for certain procedures which will be discussed later.

Industrial hygiene engineering is an integral part of industrial health work, which is specifically concerned with certain factors in the working environment which might become health hazards under certain circumstances. Such factors include dusts, gases, vapors and fumes; temperature, humidity and air motion; the kind of illumination; type of ventilation used, both natural and artificial; the physical setup of equipment; the types of materials handled with particular reference to their becoming potential health hazards.

It is the job of the industrial hygiene engineer to use various types of instruments for the collection of dusts, gases, vapors, and fumes, and to determine the quality and quantity of these materials in the breathing atmosphere; to estimate the kind and intensity of illumination; to make measurements with reference to the efficiency of exhaust ventilation systems and natural systems; to make observations relative to temperature, humidity and air motion; and otherwise to give attention to the various factors in the environment which might bear directly on the health of workers. By comparing what the conditions are with the various standards, the industrial physician has information which can be used as the basis of recommendations for control of any hazards which may exist, and also in checking the physical reactions of employees.

It is also important to consider the possibility of accidental injuries, and therefore safety engineering becomes a very definite and important phase of industrial health. It is the duty of the safety engineer to make inspections and to point out what potential injury hazards exist with respect to the running of machines, the handling of materials, and various other methods and practices in industry which have to be observed and analyzed for the possibility of injury hazards.

Another important phase of industrial health is sanitation and housekeeping. Within this category come the importance of keeping the workplace clean and orderly throughout the working period, and the provison of proper sanitary facilities, such as shower baths, washrooms, toilets, and the like.

THE FOUR-POINT PROGRAM

Now let us consider a sample survey in a relatively small plant of approximately 175 employees, including in this survey the following four different types of observations:

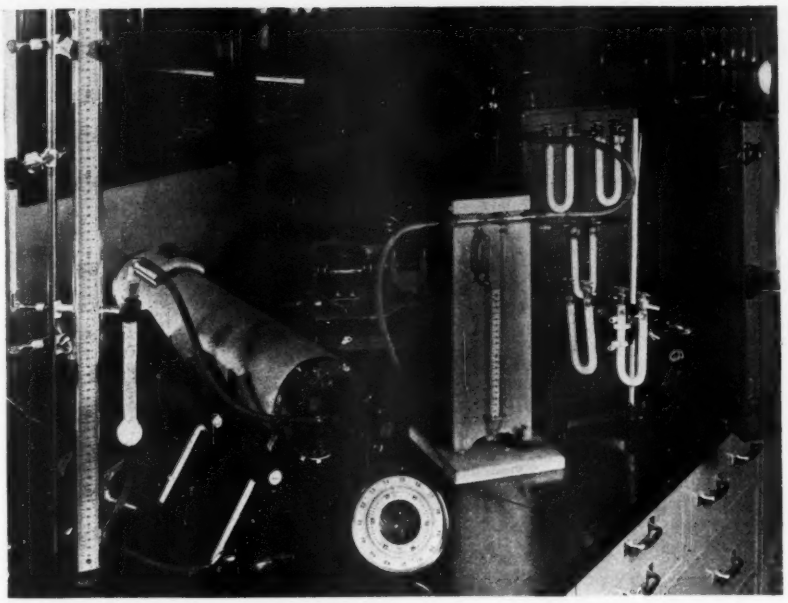
I. Safety Engineering Control
II. Industrial Hygiene Engineering Control
III. Sanitation and Housekeeping
IV. Health Control

Safety Engineering Control—During the safety inspection, it was discovered that there were a number of unsafe practices, such as the use of abrasive wheels without protection for the eyes; material being so placed that it constituted a slipping and tripping hazard; the use of punch presses without proper guards; and the unsafe use of a freight elevator. In addition to specific suggestions in each instance regarding unsafe practices, the following recommendations were made:

1. First aid dispensary adequately supplied and run.
2. Analysis of accident experience during the past ten years followed by specific recommendations.
3. The appointment of a plant safety committee.
4. Periodic inspections and investigations of accidents by safety committee, physician and nurse.

Industrial Hygiene Engineering Control—The industrial hygiene inspection showed among other things, a deficiency in the proper type of lighting; lack of providing proper temperatures, humidity and air motion; occurrence of various types of dusts and vapors in the air; and in various departments, the handling of materials known to have caused skin irritation. The following specific recommendations were made:

1. Measurements of lighting in various departments, with the establishment of proper standards.
2. The measurements of temperature, humidity, and air motion in various departments, and the establishment of proper physical conditions of atmosphere.
3. Measurements of vapor concentrations and dust concentrations, with remedying of conditions as found necessary.



Portable apparatus for determining concentrations of various vapors and gases in industrial atmospheres. Left: Interferometer. Right: Silica gel adsorption tubes connected to flowmeter and motor pump suction apparatus. Lower Center: Aneroid barometer.

4. Provision for the use of rubber gloves in various departments where the materials handled are capable of producing skin irritation.

Sanitation and Housekeeping—Observations with respect to sanitation and housekeeping showed that aisles and walkways were very often blocked; refuse disposal program inefficient; floors, toilets and washbowls in dirty condition; employees eating at work benches or in workrooms; and dirty and obsolete drinking fountains.

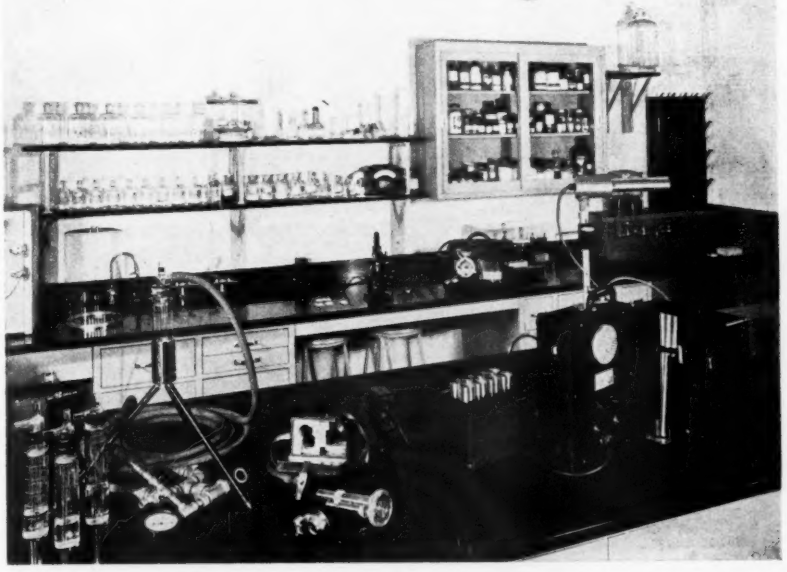
Specific recommendations were made in each instance with respect to the control of sanitation and housekeeping conditions.

Health Control—With respect to the health control program, the following recommendations were made:

1. Obligatory physical examinations of all new employees. (Using adequate forms and standards of acceptance related to the actual industrial exposures in the working environment.)
2. Voluntary physical examinations of employed persons on a privilege basis, with employer's guarantee of no discriminatory measures.
3. Compulsory periodic examinations (as found expedient) on all those employees exposed to health hazards, as determined by industrial hygiene engineering studies.
4. Follow-up procedures on all examinations when needed, for special advice concerning correction of physical defects, cooperation with family physician, and other similar measures.
5. Simple but complete system for the recording of examination data, first aid calls, absenteeism records, accidents and illnesses.
6. Provision for full time registered nurse in charge of simply equipped dispensary for first aid to accidents and illnesses, and the keeping of records.
7. Provision for part time industrial physician with prearranged hours at plant dispensary, for consultations, examinations, and plant inspections.
8. Health education program for employees, carried on through the physician and nurse, and also through a plant health committee.

ADAPTATION OF THE PROGRAM

In the adaptation of the foregoing program to the use of public utility organizations, it is realized that there may not be the necessity for carrying out all the procedures as indicated; this statement applies particularly to some of the industrial hygiene engineering methods with reference to the determination of air contamination by various dusts, vapors, gases and fumes. It should be said,



Portable apparatus for determining concentrations of dusts and fumes in industrial atmospheres. Left: Standard size impinger tubes with connection to ejector suction device for continuous sampling of dust. Center: Konimeter, especially for study of "grab" samples of dust in low range concentrations. Right: Electric precipitator for continuous sampling of dusts or fumes.

however, so that there will not be any misunderstanding, that in organizations where illuminating gas is manufactured, there will be need for the use of some of these industrial hygiene technical methods—there also may be other instances.

From information derived about 18 years ago while doing a statistical study of accidents and illnesses in a large Boston public utility, the author is aware of the fact that there is a wide range of occupations in the larger public utility groups and hence the necessity for the application of a wide range of a hygiene and health program. On the other hand, in the smaller groups, of which there are many, the four point program as given can be especially adapted to the smaller organizations with a great deal of practical benefit, both to employees and the employer. The author has had personal experience with this plan in a group of small plants having from 12 to 350 employees—the plan works. It is particularly with this point in mind that the present article was written, so that the officials in small groups could see just what kind of program of health activities could be especially arranged for their organizations.

Sometimes the plant engineer or the works superintendent is the man who would probably have charge of such a program, or at least stimulate interest enough in it, so that other professional persons might be engaged, probably on a part time basis. As an aid to any plant engineer, official, physician or nurse who may be interested, and as a starting point for this type of service, the author has devised a check list from which can be made a record of materials and supplies, processes and operations, and the methods and conditions under which work is performed. This check list will serve, as indicated, as a starting point in the study of potential, actual or legal health hazards. The interested reader may secure a copy through the Edison Electric Institute *Bulletin*, or the author.

Portable continuous carbon monoxide indicator for sampling mine and factory atmospheres.

DEFENSE ACTIVITIES

This article would not be complete without some brief mention of defense activities. It is quite likely that the public utilities of the United States will be more and more called upon for increased production. This may mean increase in working hours, or certain stresses and tensions consequent upon the pressure produced by the emergency. There has been a great deal of speculation concerning the effects of the so-called "speed up" on exposed employees. Experience during the year 1941 and up to the present time has indicated that the "speed up" alone is not responsible for the untoward reactions experienced by employees—the real reason is lack of proper supervision. By proper supervision is meant the quality of supervision which should be given and also the amount of supervision which should be given. Such supervision may be technical, either just before employment or while "breaking in" or after a considerable time of employment; it may be medical, health and safety supervision; or it may be personnel supervision, involving the social and psychological problems of the employees. The great difficulty seems to have been to get trained and experienced supervisors of the above types so that the employee can be properly supervised. The lack of trained personnel has resulted in the necessity for most supervisors being responsible for two to ten times as many persons as under ordinary conditions of employment. Under emergency conditions it can readily be seen that both accidents and ill health might easily increase in frequency and severity, such as actually has been the case during the year 1941.

The solution of this problem is obviously the training of more supervisors and the use of more of them. It is not within the province of this article to go into this subject, but it mentioned as a

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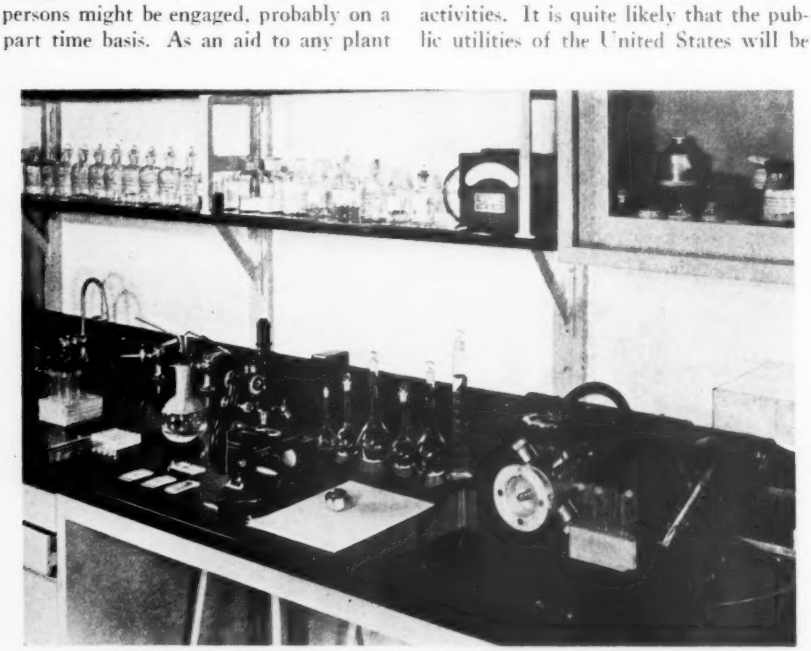

Laboratory and portable equipment for dust determinations in industrial atmospheres. Left and Center: Midget impinger tubes, pipette, counting cells, microscope, counter, and dilution flasks.

An Educational Program for Industrial Fire Prevention Protection

By Joseph A. McGuckin
Insurance Division, Philadelphia Electric Company

Excerpts from a paper presented before the Accident Prevention Committee Meeting, Pittsburgh, Feb. 23-24

MANAGEMENT has recognized over a long period of time the necessity of providing proper protection in industrial plants against fire, and the problem of determining the proper type of first aid fire fighting equipment has been given much consideration. Study by protection engineers, plus the cooperation of companies manufacturing fire fighting equipment and the National Fire Protection Association, have provided for mechanical protection against numerous fire hazards that unavoidably appear in all industrial plants, and all hazardous processes are provided with first aid protection.

Periodic inspection of properties for the elimination of dangerous practices and hazardous conditions and the installations of the proper type of protection, including automatic sprinkler equipment, have tended in a large measure to decrease the loss by fire from preventable causes.

A utility property, however, may be completely equipped with the best obtainable first aid fire fighting equipment, advantageously placed, but unless the employees who must handle this equipment have a knowledge of it and proper training in its use, the job has only been partially done. In recognition of this fact the Philadelphia Electric Company several years ago made exhaustive tests of all types of extinguishing agents on outdoor oil fires, as well as for use within our operating properties, with both fixed and portable equipment. After these tests had been completed and we were satisfied that the agents best suited to our operating conditions had been found, the company organized a fire school at which operating personnel could be instructed in the first aid treatment of fires.

The problem of training personnel was of a considerable magnitude since there are over 7500 employees spread over more than 300 operating properties, in an area of about 2100 sq mi in southeastern Pennsylvania and a small portion of northern Maryland. Many of these employees are in the Station Operating and Substation Operating Divisions, on regular shift work, and are available for school training only on their off time.

We must thus consider the availability of manpower at each location. In our service buildings, office buildings, the larger offices, generating stations and gas plants, we have organized fire brigades. But in most of our substations, and small offices, there may be only one or two employees available for fire fighting, and the fire fighting must be done in connection with their other duties.

Our chief fire hazard in the stations and substations is the presence of transil oil in transformers and switching equipment. Since electricity is present, it is necessary for us to provide equipment which may be used on electrical equipment fires.

At one of our suburban locations, we erected a metal building approximately 15 ft by 20 ft, about 12 ft high with a ventilator in the roof. Large doors were placed on one side and one end, in order that more of the employees attending the class could see the effects of extinguishing agents. We erected in the building three pieces of equipment which these men would find in our operating properties. They were installed in the same manner as they would be when in actual use. At a location about 200 yds removed, we set up an old transformer casing in approximately the same manner as it would be on one of our properties, thus simulating an out-door substation.

All transformer locations in our operating properties are surrounded by crushed stone fills, but at the fire school this was not done. A dike was erected around the base of the transformer to retain the oil which was spilled out so as to secure a ground fire around the base of the transformer. This provided a much harder test at extinguishing than would have been the case if crushed stone fill had been used thereby providing seepage for, and a cooling effect on the oil.

A water line was installed at the base of this transformer and the case partly filled. On top of the water was placed transil oil or other heavy oil primed with gasoline. By operating a valve on the water line, the level of the contents of the transformer could be raised at will.

Groups of operating employees, six to eight in number attended the class meetings. The number was purposely kept small, as it was believed that the smaller the group, the more informal would be the instruction and the operators would be encouraged to ask questions.

The instruction given the employees covers gas masks, types, construction, use, and limitations, with particular emphasis being placed upon the mask provided throughout our properties, which is known as an "all purpose mask." Its handling was demonstrated and each employee was given an opportunity to familiarize himself with the mask; how to wear it when not in use, how to place the mask over the face, tighten it, how to take it off, etc.

Instruction is then given in the various types of first aid fire fighting equipment from 1 qt to 40 gal, whether carbon tetrachloride, soda and acid, foam or carbon dioxide, their construction, the use and limitations of each type and the equipment thoroughly demonstrated to the employees.

Instruction is given also in the larger equipment for we have four 750-gal-per-min fire engines on our System. This requires instruction in play pipes and nozzles for hose lines, also the several types of spray nozzles with applicators and all necessary equipment for hose line work.

After the lecture and the question period—there are plenty of questions—

the men are further instructed in the handling of the equipment and given the opportunity to put out real fires. The metal building described earlier is closed up and gased by the burning of sulphur and formaldehyde. One of the instructors accompanies a small group of the men into the gas filled room where they remain for about 5 min. There in the gas filled atmosphere the men have every opportunity to acquaint themselves with the efficiency of the masks and a confidence is obtained that could not be secured in any other way. Before leaving the building each man is instructed to open the face piece for a moment which permits the gas to which he has been subjected to enter, and he then learns what he has been walking around in for the last five minutes, although to him the air could have been as pure as the purest that might be found outdoors.

After completion of the mask test, fires are lighted in the various oil filled or oil saturated pieces of equipment, and each man, accompanied by an instructor, is given the opportunity to extinguish the fire in the manner in which he had been previously instructed. Care is taken to have the student and not the instructor handle the equipment and put out the fire, and it is very gratifying to observe how the employees will go through the smoke and gas conditions to fight a fire after they have gained confidence in the equipment.

Instruction is then given in the use of equipment for fighting fires on units which as a rule would prove to be the most serious in our operating properties, these being outdoor transformer oil fires.

Transformers as a rule are installed in banks of three or more and in addition to extinguishing a fire it is also necessary to prevent the spread to adjoining units, and therefore hose lines of 1½ or 2½ in size provided with proper play pipes or nozzles are the best protection against outdoor hazards. It was not until in recent years that any one would think of attempting to fight an oil fire with water, but under certain conditions we find this to be the better method and instruction is given in the use of water in such emergencies.

The oil in the transformer shell is primed and set on fire, the water level is raised in the transformer permitting an overflow of the burning liquid which produces a very serious condition plus a bad ground fire. It is permitted to burn about 5 min; this would be the approximate time it would require our men to get out their equipment and hose lines. The men work in groups of four or five and while some serious fires have been encountered, they have been extinguished.

In addition to classes at our fire school, instruction is given at many of our outlying service buildings, more especially in the type of extinguishers placed to protect the risks in that particular location, as they will have a different type of fire. Fire brigades are formed in these locations and particular emphasis is placed on the importance of the education of such brigades. Each man is instructed in the use of extinguishers on actual fires.

One important effect to be gained in this educational work is that it eliminates the fear of fire among employees and the fact that it has developed confidence in the use of gas masks. The general reaction of employees who have received this instruction has been favorable. Those who have been selected to attend the school have been paid for their time, and there are many who have requested permission to report to the class on their own time, indicating a willingness to cooperate in our problems that is very gratifying. On at least two occasions since this school has been operating we have had fires in substations which might have attained serious proportion if the operator on duty at that time had not had the training he obtained in the Company fire school. It is our intention to have each employee, particularly those in station operating and substation operating divisions, attend this school at regular intervals.

EDITOR'S NOTE: Mr. McGuckin also discussed the subject of fire-protection against incendiary bombs, at this meeting. Mimeographed copies of this discussion are obtainable from the Institute.

Walker Heads Newly Formed Council of Operating Companies

TOM P. WALKER resigned as president of the Gulf States Utilities Company, Beaumont, Tex., this month to become chairman of the newly organized Council of Electric Operating Companies, formed to extend fullest cooperation of participating members to the Federal Government in the war emergency.

Widely recognized as one of the ablest and best informed utility executives in the country, Mr. Walker will devote full time to directing the activities of the Council, which has as its purpose the assisting of various governmental agencies responsible for the war effort by coordinating the experience, man-power and equipment of the electric operating companies.

The Council is composed of representatives of operating electric utility companies throughout the United States. In the initial announcement of the Council Mr. Walker emphasized that since power supply is a vital factor in war-time, "this problem alone offers immediate and important opportunities for constructive cooperation between the industry and the government." The Council's office will be located in Washington and will open about April 1.

Mr. Walker became president of the Gulf States Utilities Company in 1929 and under his direction the company has grown to where it now furnishes electric service to more than 200 communities and rural areas in Texas and Louisiana. He first entered utilities work in 1915, with the Reno (Nev.) Power, Light and Water Company. From Reno he went to the Haverhill (Mass.) Gas Light Company, becoming manager of the company.

Subsequently, he became manager of the Baton Rouge Electric Company, now a part of Gulf States Utilities, and after several years at Baton Rouge went to El Paso as manager of the El Paso Electric Company. Prior to his service as president of Gulf States he was vice-president in charge of operations of the Virginia Electric and Power Company at Richmond.

Mr. Walker served two years with the army in the first World War, including a year and a half in the A.E.F. with the First Division. He was awarded both the Order of the Silver Star with Oak Cluster and the Croix de Guerre in 1918.

For more than a year he has devoted much time to cooperating with government officials to speed up national defense effort in the Beaumont territory.

War-Time Developments in Electric Wiring

Utilities Can Aid Conservation of Materials

By E. S. McConnell

SEVERAL developments have occurred in recent weeks that promise to have great significance in electric wiring practices. More than ever before, emphasis is placed on the conservation of strategic materials. Electric utilities can contribute to winning the war by placing their technical knowledge and experience in wiring matters at the service of those concerned with essential construction during the war.

New Defense Housing Critical List

A revised edition of the Defense Housing Critical List has been issued by the War Production Board, effective as of February 24. The Critical List is a tabulation of material for which priorities assistance will be given for the construction of defense housing including government owned or assisted, and privately financed such as through the Federal Housing Administration. It includes electrical, plumbing, heating, and other kinds of essential building materials. The new List is more specific than the original issued in September, 1941, which it supersedes. It is based upon the present critical position of many materials essential to the construction and equipping of houses and is subject to revision as changes in the situation may develop. The revised Critical List is geared to war conditions, but it will provide for substantial high-grade construction, and at the same time conserve the nation's vital supplies of steel, zinc, rubber, and other materials to the greatest practical extent. Only materials and products included in the Critical List are eligible for procurement by the extension of a Preference Rating Order granted for a housing project.

Limitations on Outlets

The original Critical List of last September restricted the number of outlets that would be permitted in defense housing, and very little change has been made in these limitations. In general, rooms constituting major living spaces are permitted to have a maximum of four outlets, while halls, bathrooms, and similar spaces are limited to two outlets. Special purpose outlets for ranges, refrigerators, and for heating, ventilating, and plumbing equipment are permitted within reasonable limits. Combination outlets, such as a switch and a convenience outlet are counted as one, provided the devices are installed in one outlet box.

Non-Metallic Wiring Methods

Under the provisions of the Critical List, metallic conduit is no longer permitted for the service entrance. Non-metallic service cables are recognized for overhead services, and moisture-resisting cables in non-metallic raceways are permitted for underground service entrances.

For interior wiring, emphasis is placed on the non-metallic wiring methods. Covered neutral cable (CNX), single insulated conductors for knob-and-tube wiring, and non-metallic sheathed cable are the preferred methods. Non-metallic service cable may be used for range and water heater circuits. Armored cable is limited in use for embedding in plaster and similar purposes. Electrical metallic tubing is restricted for use in embedding in concrete or masonry, or for enclosing No. 4 conductors or larger where they are exposed. Rigid conduit is similarly limited and restricted to locations where the installation is subject to severe mechanical injury.

Another major change in existing practices is that non-metallic types of outlet boxes are specified for general use and metallic boxes are eligible only for use in connection with the restricted use of armored cable and conduit.

Suggested Municipal Ordinance

It has been recognized that war-time necessities may conflict with peace-time codes and ordinances in some localities. At the suggestion of the War Production Board, the American Municipal Association in cooperation with the several state Leagues of Municipalities, is sponsoring a Suggested Municipal Ordinance, the adoption of which will provide that existing regulations that conflict with the Defense Housing Critical List shall be waived for the duration of the war.

Recent Revisions in Code

A recent interim revision to the National Electrical Code now permits the general use of conductors in parallel. This will result in a substantial saving in copper and enclosing conduit. Another interim amendment to the Code provides that the higher current carrying capacities permitted in the 1937 and earlier edition of the Code may be used for Type R Code wire. The current rating of other types of wire, such as RP, RH, RU, and SN remain unchanged from the values given in the 1940 National Electrical Code. Table II in the 1940 Code for conductors used for knob-and-tube work and for open wiring on insulators also remains unchanged.

General Revision of Code Postponed

Another significant development is that the Electrical Committee of the National Fire Protection Association, that formulates the National Electrical Code, has tentatively decided that the general revision of the Code, looking toward a 1943 edition, will be postponed indefinitely because of the war and that meanwhile immediate and necessary changes appropriate to meeting the conditions occasioned by the war would be handled by means of war emergency supplements to the existing 1940 edition of the Code. A unanimous decision to this effect, subject to ratification by a letter ballot of the Electrical Committee, was arrived at during an informal meeting of a large number of the Electrical Committee members and alternates who were assembled in New York during the week of March 9 for the purpose of considering revisions to be incorporated in the 1943 edition of the Code.

Emergency Supplements to the Code

Several other tentative decisions relating to the war emergency were arrived at during the course of the meetings in New York. It was unanimously voted, subject to ratification by letter ballot, that a small working subcommittee be created with power to represent the Electrical Committee in studying and making recommendations for changes in Code requirements as they arise due to exigencies

of the war situation. These recommendations would not have the full formal status of the Code text, but would provide authoritative guidance to Code administrative agencies for permitting the use of alternative materials and methods which will conserve material and thereby contribute to the war effort.

CNX Being Recognized in the Code

Another important action on the part of the Code Article Committees was the recommendation for recognition of Covered Neutral Cable for residential and war emergency construction with the same general limitations that now apply to non-metallic sheathed cable. The use of non-metallic outlet boxes and cover plates was specified for use with Covered Neutral Cable. At the same time it was recommended that Weatherproof and Slow-Burning Weatherproof conductors (without rubber insulation) be permitted for use as the grounded neutral conductor of alternating current circuits not exceeding 208 volts to ground for all wiring methods and cable assemblies now recognized in the Code. These recommendations are subject to formal ratification by the entire Electrical Committee. Although no specific action was taken, there has been discussion of the use of Weatherproof and Slow-Burning Weatherproof conductors for use with knob-and-tube work and for open wiring on insulators.

Still another development was the recommendation that small diameter synthetic-insulated wires (Type SN) be recognized for general usage. In the past, this type of wire has been limited for rewiring existing raceway systems. Another Committee recommended that the effective date for the mandatory use of Type S tamper-resisting fuses be postponed until after the war.

Electric Range Circuits

The Code article committees having to do with electric ranges have recommended the liberalization of the present electric range demand factors to permit smaller conductors for a given number of ranges. This will conserve copper where ranges are installed in necessary wartime housing, but it is based on a long range study that has been under way for some time. Another recommendation is for the full recognition of a connection to the circuit neutral as an acceptable method of grounding electric range frames where the frame is not otherwise grounded or in contact with grounded structures.

Accounting Meetings on War Emergency Problems and Procedures to Be Held in May

PLANS for a two day meeting of accountants in the electric and gas industries were discussed at a meeting held on March 19 by a group of representatives of the two industries, headed by Messrs. L. L. Dyer (Lone Star Gas Company) and L. A. Mayo (Connecticut Light & Power Company) for the gas industry and Messrs. G. H. Bourne (Commonwealth & Southern Corp.) and F. B. Flahive (Columbia Gas and Electric Co.) for the electric industry. Cleveland, Ohio, was chosen as the most central point for such a meeting, which is scheduled for May 11 and 12.

"War Emergency Accounting Problems and Procedures" will be the theme of the full series of meetings. Tentative plans are being arranged for only one general session on Monday morning, May 11, on subjects of interest to the full group of industry delegates. Monday afternoon and all day Tuesday, May 12, have been reserved for individual *open* group or committee meetings.

The entire meeting is being planned as a series of informal papers or presentations of experiences and plans of representative companies on war emergency problems and procedures, to be followed by floor discussions in which all delegates will be asked to participate. The broader phases of accounting; personnel and training procedures; reports required by and cooperation with the War Production Board; Taxation; Insurance; Transportation; and possible short cuts in filing of formal regulatory reports will be discussed at the general or larger group meetings. Customer Accounting, Meter Reading, Billing, Customers' Relations and Credits & Collections, although receiving some broad consideration at the larger meeting, will receive particular attention at the individual group or committee meetings.

A Steering Committee, appointed to work out all details for the meeting is headed by Messrs. Flahive and Mayo. Others on this committee are Messrs. O. H. Ritenous, Washington Gas and Electric Company; H. B. Hardwick, The Commonwealth & Southern Corp.; and G. W. Fuchs and H. R. Flanegan of the Philadelphia Electric Company.

Utility men can contribute a great deal to the conservation of copper by assisting in the location of outlets, the best use of combination outlets, the location of service entrance, and the use of multi-wire circuits. A careful study of the geometry of an installation, to connect outlets by the shortest routes, will give better wiring installations with less wire and result in the minimum loss of energy.

Every effort should be made to enable builders to live up to the spirit as well as the letter of war-time restrictions. In many cases there is a happy and easy solution to the problem of providing *future* outlets that are necessary for a wiring system that is both safe and convenient. The wiring layout and the location of outlets may be planned in accordance with liberal standards of future adequacy. The structure can be prepared for the installation of additional outlets when they are available, by boring suitable holes and leaving a piece of string to facilitate fishing in the future cable. Wiring installations using Covered Neutral Cable lend themselves to future additions because of the small size and the ease with which CNX may be fished.

Utility men can also contribute to winning the war by broadcasting information regarding the newer and better methods of wiring; by taking the initiative in pointing out the safety advantages and the opportunities for conserving rubber, tin, copper, steel, zinc, and other strategic materials to architects, engineers, representatives of housing agencies, electrical contractors, and wholesalers. Covered Neutral Cable and Weatherproof neutrals conserve vital materials and are now being recognized in the Code. You can also help them design necessary wiring for the greatest economy of materials; by telling them where they may obtain further information; and by urging that necessary quantities of service entrance cable, covered neutral cable, non-metallic outlet boxes and other electrical materials be ordered as far in advance as possible in order to assure economy and orderly production of cable and wiring materials.

EDITOR'S NOTE: Copies of the Defense Housing Critical List (electrical section), of the Suggested Ordinance, and of material on Covered Neutral Cable, mentioned in the foregoing article, are available from Edison Electric Institute.

Many in the audience will recognize this room—old-fashioned lamps, strained, uncomfortable positions—the cause and the result of bad seeing conditions.

Unshaded bulbs . . . another sight hazard common in too many homes is pointed out by the sight expert in this family's dining room, and a solution recommended.

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HERE in these few scenes from "Light Makes Sight," new full color talking motion picture just released by the National Better Light-Better Sight Bureau, is the story of an average family's need for Better-Light—and the Better Sight that approved lamps and fixtures brought them.

"Light Makes Sight" shows the audience a home that might be theirs; illustrates, in dramatic full color, the difference between good and bad seeing conditions; tells how easily and inexpensively home lighting may be modernized, and shows the Better Sight that results, by the use of the pictorial method —most dramatic and convincing of all!

Designed for lasting educational value, "Light Makes Sight" will be of real aid to utilities in convincing customers of the desirability of higher illumination levels for sight protection, and of light for cheerful surroundings in these times of stress and hazards.

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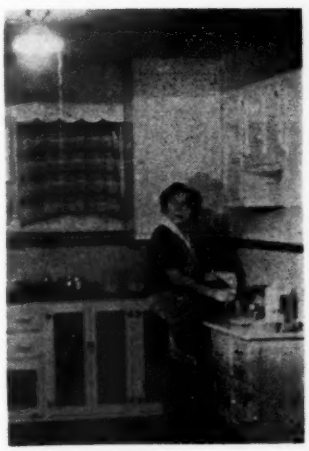

Inadequate ceiling fixtures bring eyestrain.

Modern fixtures now guard precious sight in this dining room . . . give food and complexions their natural colors, provide a cheerful setting for more enjoyable meals.

Plenty of light for every member of the family in this living room—and this scientifically correct light will mean better health for the days to come.

Priorities on Safety Equipment As They Concern the Electric Utilities

Excerpts from papers presented before the Accident Prevention Committee Meeting, Pittsburgh, Pa., Feb. 24, 1942

RUBBER PROTECTIVE EQUIPMENT

By T. R. Claffy

W. H. Salisbury & Company, Chicago, Illinois

WITH barely enough rubber on hand to carry us through one normal year and being faced with the greatly increased demands for rubber products in our war efforts, combined with the amount of rubber that will be required for strictly essential uses, we must recognize the seriousness of the situation and the necessity for placing the consumption of rubber under very drastic restriction.

The latest restriction order, Amendment No. 3 to OPM Order No. M-15-B, effective, Feb. 1, placed a more rigid control upon the use of rubber and sets forth the products which can be made within percentage limitations. Please understand that the Order does not state which articles cannot be made but very definitely lists those which can be made. War orders are to be filled without limitation. The use of reclaimed rubber and scrap rubber is still permitted.

The limitations are predicated upon each manufacturer's average monthly consumption of rubber used in the production of the same classes of goods during the base period, which was established as being the twelve months prior to March 31, 1941. Linemen's Rubber Gloves are on the permitted list to 100 per cent. Molded and extruded articles are limited to 25 per cent because most consumers goods are made by these processes. Unfortunately for us Line Hose, Insulator Hoods, Blankets and certain other items are in this classification and, until the rule is modified we must stay within the 25 per cent quota. However, an appeal has been filed with the authorities at Washington and we have been assured that an amendment to the Order will be issued on March 1, which will raise this limitation to 100 per cent. Rubber footwear for workers are restricted to 30 per cent, rubber clothing for workers is cut to 40 per cent, industrial protective clothing and surgical goods are permitted to 100 per cent. The restrictions continue in a like manner all down the list. All consumers rubber goods are out as well as many industrial items unless such articles can be made from reclaimed or scrap rubber.

It is estimated that the restrictions now in force will equal approximately 75 per cent of our former uses for rubber. Additional savings will be effected by substituting reclaimed rubber in place of new rubber wherever possible. Even Government specifications are being rewritten to permit the use of reclaim either entirely or partially in many important articles. As an example, the tube and cover of water hose will contain no new rubber at all. By all of these means it is hoped that our rubber supply can be stretched out to carry us through the critical period ahead.

There is no certain way in which any manufacturer can forecast the position we will be in one or two years hence. The Government has not given out figures as I stated before. I personally believe, however, that the authorities will continue to recognize the importance of Linemen's Rubber Goods and will continue to sanction the use of rubber for their manufacture as long as any rubber is available for industrial work. Satisfactory Linemen's Rubber Goods including gloves can be made from synthetic rubber if need be, and it appears to me that conditions must be a great deal more severe than is now anticipated before rubber for this use is entirely curtailed.

As our supply of crude rubber diminishes, other types of rubber satisfactory for Linemen's Goods will be made available in steadily increasing amounts and, while it is possible that many classes of rubber goods will meet with further curtailment I feel reasonably certain that there will always be a sufficient amount of material available for this particular use.

It is advisable to conserve present stocks of Linemen's Rubber Goods as far as possible and also to consider means by which their useful life may be prolonged.

Safe Practice Pamphlet No. P U 3 issued by the National Safety Council suggests the ways for proper storage, both on the trucks and in the storeroom, and it also specifies the means by which rubber goods may be cleaned and handled for longer service life.

From my observations I believe that the majority of Utility Companies have not favorably regarded the matter of repairing rubber goods and it seems to be the general opinion that the safety of reconditioned blankets or other devices would be impaired thereby. It is also thought by many safety authorities that patched rubber goods have bad psychological effect upon the men and, thus there would exist a tendency to reduce respect for, or obedience to, safety rules. To such companies I would suggest that *all discarded articles be set aside for a later selection of the best pieces and to have repairs made upon them if new supplies are not quickly obtainable.*

However, several companies have regularly repaired blankets by cementing or vulcanizing rubber patches over the injured parts. The practices vary to some extent as is evidenced by the fact that most companies restrict the number of patches which may appear upon a blanket to either two or four, while other companies allow any number of repairs to be made as long as the rubber appears to be in good condition. Some companies will repair clean punctures only, while others repair snags or tears up to a limit of 2 inches long. Most companies use a vulcanized patch while others use a cold cemented patch.

Such companies have the repair work done in their garages and by the men who regularly repair inner tubes. Garages are usually equipped with spot vulcanizers and the standard uncured rubber strips that are used for tubes is suitable for blankets. Most companies, however, repair blankets in their laboratory because they believe that one accustomed to testing rubber goods will do more careful work from an electrical point of view.

There is a difference of opinion between the value of cold cemented patches and vulcanized patches. Either type is suitable providing the work is expertly done. I personally would prefer the hot vulcanized patch because it offers more assurance that the patch will stick on longer and there is less danger of careless work destroying the bond between the patch and the blanket by this method.

There is available on the market the "Shaler" type of patch. This patch of uncured rubber is furnished in either round or oblong shapes, and is bonded to a metal dish. On the opposite side of the dish is a cardboard like material which is impregnated with a heating substance. The manufacturer sells separately a clamping device to hold the patch in place over the part to be repaired. The heating element is ignited and the heat engendered vulcanizes the patch in place. The dish is then easily removed. Full directions about first roughening up the rubber and the application of the patch is given on the container. However, we believe that a better job can be done if the rubber is softened with a good solvent such as benzol after being roughened up, and then covered with a coat of rubber cement over the area. The cement should be allowed to dry thoroughly before the patch is put on.

We would also recommend that a patch be applied to both sides of a puncture.

After a repair is made the blanket should be subjected to a test of either 15 or 20 thousand volts. Either water or wet felt electrodes should be used as it is quite likely that corona will cut the rubber patch if it is held firm between metal electrodes while under test.

Some companies repair sleeves along the same lines as explained above, but it is customary to allow but two patches to appear on any one sleeve. Coats and boots may be repaired in the same manner.

Line Hose and Insulators do not lend themselves to homemade repairs as the injuries are usually so severe that factory equipment is necessary for a satisfactory job. These articles do not lose dielectric with age but a deeply oxidized surface presents some possibilities of danger when the devices are used in wet weather. Water or moisture that is held within the cracks forms a path for current to creep over the surface and to a rather high degree depending upon the depths of the cracks. Therefore one may consider a plan of allowing badly oxidized rubber goods to be used in dry weather only and by providing smooth surface goods for use in wet weather. Another plan would be to buff down the oxidized surface to smooth rubber.

I offer all of the above only in the form of suggestions and assume that this committee will consider and then recommend the practices that should be followed.

MASKS, PROTECTIVE CLOTHING, ETC.

J. B. Davies
Mine Safety Appliances Company

THE War Production Board has recognized the importance of safety equipment by assigning to it a separate group, along with fire equipment, in one division of the WPB.

Public utility companies engaged in the manufacture or distribution of gas, electric, water, or steam, can obtain an A-10 priority rating under Preference Rating P-46. If this A-10 rating is applied to every purchase order placed, it will be of great help to the safety equipment manufacturers and will in turn help the purchaser obtain his desired equipment. Public utility companies are sometimes given higher priority ratings such as an A-2 or an A-3 to cover a specific construction project such as a power station. When safety equipment is required for such a project, this higher assigned priority rating should appear on all orders placed. An A-10 priority is of some help to the manufacturer. An A-3 rating is much better, while a rating as high as A-1-j is necessary to obtain some materials such as the metals.

I would like now to discuss briefly how the priorities system affects the manufacturer in obtaining certain raw materials as applied to specific safety equipment products.

Respirators, for example, to be readily accepted and worn must be light in weight and comfortable. Almost every manufacturer has used aluminum in their construction and it was originally hoped that the relatively small amount of aluminum used by our industry as compared with total consumption would be permitted, but this has been ruled out by WPB. We, and probably other manufacturers, are working upon or have perfected plastics in place of aluminum. As a result of the development work to use plastics as a substitute may come a greatly improved product and one which may be superior and more comfortable than the previously considered indispensable aluminum.

Rubber is used in all respirators and is indispensable in gas mask facepieces and parts. Rubber has been definitely allocated by WPB. Mask manufacturers are permitted to use during the month of February 140 per cent of the amount of crude rubber used monthly during the period April 1, 1940, to April 1, 1942, and for the month of March I believe it will be reduced to 125 per cent. This quantity of crude rubber permitted to be used stands regardless of the size of the stock of crude rubber which any manufacturer may have on hand. The composition of rubber used in the manufacture of facepieces for masks, respirators, etc., must be rigidly controlled, since in addition to the requirements of tensile strength, long life, etc., we must control the toxic properties of rubber which is worn next to the skin. Consequently, we cannot employ reclaimed rubber and therefore our monthly allotment of crude rubber is being reserved almost entirely for gas mask and respirator facepieces. Other rubber products, such as gaskets, etc., formerly made from crude rubber, can be made from a proportion of reclaimed rubber.

I would like to emphasize just how these restrictions affect the customer who has been accustomed to purchase masks and obtain immediate delivery. Limitation of the use of crude rubber results in limiting the number of facepieces and masks which can be produced monthly. If we were to receive a large number of orders carrying an A-1-a priority, it is conceivable that the entire monthly production might be required to fill such orders and we would be helpless to furnish those regular customers having a very low or no priority rating. This condition does not yet exist, but it is responsible for slower deliveries in some instances.

The obtaining of steel has caused us some difficulty at times. Sheet steel is used in the manufacture of First Aid cases and for oxygen cylinders for Inhalators, Oxygen Breathing Apparatus, etc. An A-10 rating is not high enough to obtain oxygen cylinders since these are manufactured by firms making other products carrying a much higher priority.

First Aid supplies come under the Health Supplies rating plan which provides an A-10 priority. This is high enough to obtain some of the needed raw materials, but is inadequate for others. The manufacturer makes application for his expected requirements covering a quarter, then if demand exceeds expectation, a supplementary application may be made but this results in certain delays. Reasonable advance ordering of First Aid supplies will help the manufacturer gage his requirements in raw materials for the next quarter.

Muslin used in the manufacture of Triangular Bandages and many other First Aid items is extremely hard to obtain in sufficient quantity due apparently to Government demands for cloth to which loom capacity has been diverted. Tin is no longer permitted to be used for collapsible tubes in which most ointments have been put up and we are now using composition capsules. We have a constant fight to obtain sufficient scissors and tweezers for First Aid Kits since these are steel products and require normally priorities higher than A-10 for prompt deliveries.

All Service Gas Masks have been used for twenty years by the Fire Departments, Public Utility Companies, and many others. War construction has greatly increased the demand for these masks for fire fighting purposes. The large Ordnance Plants, Shipyards, and ships of the Maritime Commission are creating large demands, all of which carry A-1-a priorities. The limitation of the use of rubber, together with these high priority ratings have resulted in slower deliveries in spite of our increased production facilities.

Asbestos required for the manufacture of Fire Fighting Suits, Gloves, etc., is hard to get and usually require better than an A-10 priority for prompt deliveries. Accordingly, deliveries of this equipment are slow.

Bakelite for Protective Hats, metals and meters for gas detecting instruments are other raw material problems which we have.

You can do a great deal for yourselves by applying the highest possible priority rating which you are permitted to use on every order which you send to a safety equipment manufacturer.

HAND TOOLS, MISCELLANEOUS EQUIPMENT

By H. B. Wilson

Mathias Klein & Sons

GOVERNMENT requirements of pliers, wrenches, hammers, etc., will reach a staggering volume, and this must inevitably restrict the supply of similar tools (and perhaps all tools) even to rated industries such as the operating power companies.

The manufacturers of hand tools, as an industry, will probably find their capacity absorbed by government demands, for perhaps the balance of this year; and by capacity I do not mean the ordinary one shift operations but a three shift job with all that it entails.

It is already evident that we shall be compelled to exercise all kinds of restraint and economy such as we have not heretofore dreamed of; but we believe that by proper presentation of the situation to employees, the operating companies will have full cooperation, and that with this there should be no undue hazards taken or hardships borne in the job of maintaining electric service or in making such extensions as may be necessary during the emergency. It should be repeatedly emphasized however there is very real necessity for utmost conservation.

Regarding such tools as we manufacture, it would probably be convenient to divide them into classes for proper consideration:

Pliers—Pliers are drop forged from alloy tool steel, which is on the scarce material list. Priorities should be provided on orders placed for such material. Employees should be cautioned not to abuse these tools but to treat them carefully, occasionally oiling the joints, etc., and in this way get the maximum service, cutting unnecessary replacements to a minimum.

Linemen's Climbers—The difficulties of obtaining material are similar to those outlined for pliers and priorities should invariably be attached to orders. Employees should be instructed in proper sharpening of the climber gaffs and particular instructions should be given against any grinding of the gaffs, which is likely to set up heat and spoil the tool.

Leather Goods—(Belts, Safety Straps, Climber Straps and Pads, etc.)—So far leather has not been put on the scarce materials list, but first quality harness leather is very scarce, partly due to the large quantities used by various government departments. Employees should be instructed in the care of their leather goods, particularly in the avoidance of unnecessary damage from careless use.

Apart from the consideration of leather, the forged hardware (buckles, snaps, "D" rings) constitutes a use of steel which is increasingly difficult to obtain and for which we cannot conceive of any substitute.

Wire Grips—Orders for grips must bear priority ratings.

Tackles—The steel in the blocks and hooks of tackles is a scarce material and so is the rope. Pure Manila rope is no longer obtainable, other than on a high priority requirement, but the rope manufacturers are supplying an acceptable substitute.

Torches and Furnaces—The obtaining of brass and bonze parts for these items has become almost impossible.

Linemen's Wrenches—These are drop forged from chrome nickel steel, on the scarce list, and priorities should be applied to all orders.

Linemen's Knives — See remarks above, applying to Wrenches.

Industrial Health

(*Continued from page* 90)

factor, definitely apart from the technical problems of industrial health *per se*, which has a very definite effect upon the health, safety and morale of the employed groups.

Conclusions

In conclusion, it may be stated that the foregoing program with respect to industrial health including the four points, safety engineering control; industrial hygiene engineering control; sanitation and housekeeping; and health control procedures, is one which may be well adapted to large, medium sized and small groups of employees. The quality of the service rendered and the scope of the beneficial results obtained naturally depend upon the experience and ability of trained personnel secured to do this work, as in all other lines of effort.

It is believed that the check list from which can be made a record of materials and supplies, processes and operations, and the methods and conditions under which work is performed in any group, may serve as a starting point in the study of potential, actual or legal health hazards; and finally, that such a check list may act as a stimulus in interesting industrialists and their staffs to the end that well supervised programs of industrial health may be put into operation, or that previously existing programs may be improved.

EEI PUBLICATIONS

A catalog of all EEI publications is available upon request to

EDISON ELECTRIC INSTITUTE
420 Lexington Avenue, New York

How Utilities Are Aiding Farmers to Secure Maximum Food Production

IN recognition of the vital part that increased farm production will play in the war, electric utilities throughout the country are making special efforts to aid the farmer in securing increased and most efficient use of his equipment, both as a labor saving move and to increase production.

Various plans are being used to stimulate increased use by the farmer of his present equipment, and since the increased demand for agricultural commodities has caused many farmers to expand their farming operations, efforts are also being made to locate used equipment which has been outgrown but will still fit the needs of the smaller farmer. In addition to personal contacts with the farmer and active cooperation with state and local farm and conservation groups, direct mail will be used more than ever to keep the farmer informed of uses for his electrical equipment, and to encourage economy of critical materials.

A cross-section of utility farm service activities is given in the following excerpts from information secured from utility representatives by the Edison Electric Institute:

New England

"Our company has given many suggestions to manufacturers of rural electric equipment as a result of close tie-up with our customers," writes JOSEPH H. BODWELL, Rural Sales Supervisor, Public Service Company of New Hampshire. "These have been incorporated by them in their products, and we believe it has resulted in much benefit to everyone concerned. In 1942 we are planning to continue this work to an even greater degree.

"Our company maintains salesmen in each district where we operate a retail store. These salesmen are trained in the use of rural electrical appliances, to the point where they can demonstrate the use of electricity for each farm problem. Our servicemen are also trained in servicing all rural electrical appliances, and are subject to call day and night. In other words, we extend twenty-four hour service on all appliances sold."

MICHAEL A. CAFFREY, Farm Representative, Brockton Edison Company, states: "Our position in 1942 will be about the same with service to our rural group taking precedence over actual sale of equipment. With a shortage of farm help, it means cooperating with and advising them how they can use electricity most effectively and economically.

"We consider our rural customers as a preferred group in that we have prepared a list of all large users of heat and power, giving the connected load and its use, which is posted with our Superintendent of Distribution, who refers to this list whenever a disturbance or interruption of service occurs."

Middle Atlantic

C. E. JEERINGS, Supervisor, Rural Electrification, Rochester Gas and Electric Corp., writes: "Electricity is a medium that can be employed to a large extent toward solving the present acute labor problem on the farm. At present it is not used to the extent that it should be. We therefore are planning a program through local advertising and other mediums to acquaint our customers with how labor-saving equipment can help in food production.

"Through youth organizations and granges, we plan to carry out a program instructing groups on care and minor repairs of electrical equipment. There also will be some effort to see that proper service facilities are set up to take care of major service problems. It is hoped that such a program will insure continued uninterrupted service and a saving of materials.

"Our policy of dealer cooperation will be continued as usual. Only labor-saving equipment will be stressed. Work with farm and youth organizations will be continued as much as possible bearing in mind its importance on post war conditions."

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"For the past three years our farm development men have been spending 90% of their time calling on farmers on their farms. The purpose of these visits has been to discuss their individual electrical problems, wiring, maintenance and repair, and new equipment. Along with this, we make use of advertising in farm papers, and send 'Electricity on the Farm' to a list of farmers," says F. M. WIGSTEN, Central Hudson Gas & Electric Corp. "Our results from these efforts have been quite satisfactory. In so far as possible we plan to continue with this plan, stressing the maintenance and repair of equipment.

"From the food production angle it is extremely important that all farm electrical equipment receives proper care and is kept in good repair. New equipment for new producers and as replacements will be needed, and we shall strive to keep our dealers active with repair parts and new equipment on hand or readily available. We are receiving more requests for information about new equipment and on the proper care and use of installed equipment than ever before. If our farmers need and want this service, we hope to give it to them until such time as rationing or other obstacles may prevent."

East North Central

"We have given considerable thought as to how electric service can do its part to stimulate production on the farm, and at the same time, lessen the strain on farm labor, which is diminishing to the vanishing point," writes F. A. COFFIN, Vice President, Wisconsin Electric Power Company. "In our endeavor to bring to our rural groups what electric service can mean to them in increasing production, and as a substitute for farm labor, we have thought it best to turn all our promotional effort in that direction.

"We intend to carry this trend in our advertising copy throughout the year. Our exhibits at the Waukesha County Dairy Show will deal nearly exclusively with the producing end of the farm, such as milking machines, water systems, chicken and pig brooders, sun lamps, etc., and wherever possible we will attempt to tie-in this equipment with the hours of labor that can be saved by its use. We are also desirous of developing a bulletin showing the use of electrical equipment and how they can save in labor and increase production.

"In past years it has been our policy to

put on quite a number of rural cooking schools at various locations throughout the territory. We intend this year to inject into these meetings the use of the home canning of meats and vegetables as part of the victory program.

"In discussing the farm outlook with various small town business men and farm leaders, we find that farmers are in the best position that they have been for a good many years, and nearly all of them are attempting to get increased production of farm products without too great an increase in their farm plant."

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R. K. DERRY, Rural Service Supervisor, The Ohio Power Company, writes: "The present national emergency has, of course, materially changed our thinking with respect to future activities. The overall effect of this curtailment may make it necessary for us to formulate necessary plans; however at the present time, we believe the elimination of new line construction presents an opportunity we have been looking forward to for years, in that it will make possible a greater degree of contact with our existing rural and farm customers."

West North Central

"Our farmers of Minnesota are more 'economically production' minded, and feel that mechanical equipment should be used much more than in the past, and production handled to decrease cost in every way possible," says C. P. WAGNER, Northern States Power Company.

"The government has acknowledged the value of the milking machine and is allowing production to about 200% of 1940. Even with this production, however, our sales organizations are holding machines for those who can prove the need rather more than those who show a desire for the use of the machine. Water systems are being modernized and improved in order to maintain production. A good many farmers are considering feed grinding at home with automatic installations rather than a portable grinder or the elevator custom mill. Every effort is made to use feed to better economy.

"There are many prospects along existing lines which can be connected under the present priorities ruling, and so long as the government allows these connections we shall use our graded down materials and whatever new materials we can obtain in the market, subject to our ability to spread the work so as to use a minimum of transportation.

"The Rural Department expects to adjust itself to these situations and to assist these farmers in getting equipment and in properly operating same."

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C. E. MICHEL, Vice President, Union Electric Company of Missouri, sums up his company's policy as follows: "Promotion of the sale of merchandise and equipment will be sharply limited by scarcity of materials and consequent reduced factory output. Extension of the useful life of electrical equipment, both by careful use and by repairs, must be encouraged. Use of additional power will not be directly sought. Greater usefulness of present current consumption and of present equipment, in increasing the efficiency both of farm operations and the farm household, will be promoted.

"Two thousand farms served are truck farms and 350 are dairy farms. The war-time need for increased production of dairy, vegetable and animal products with less expenditure of labor will, of course, heighten the value of electric service to these farms.

"Personal contacts with farmers on their own premises have always been found to be the most effective way of being helpful to them and of promoting our rural business. Our Rural Service representatives are, through these contacts, able to learn the characteristics of the individual farm and to analyze the farmer's methods and determine where electricity can be put to work profitably. This procedure should be equally effective in meeting the present need for promoting more efficient application of existing electrical service.

"During 1942 more extensive cooperation with 4-H Club work is planned. With more poultry and egg production being advocated by the federal government, we are working in cooperation with local and state agricultural agents in devising plans for electric brooders that may be constructed by 4-H Club members. Poultry brooding with this type of equipment will be carried on as a project by several newly organized poultry clubs in our territory this year. Other clubs will take up Farm Electrification as their project, including the care and maintenance of electrical equipment used about the farm and home.

"Since it is becoming increasingly difficult to obtain new electrical farm equipment, especially motors, and since the increased demand for agricultural commodities has caused many farmers to expand their farming operations, every effort is being made to locate used equipment which has been outgrown but will still fit the needs of the smaller farmer. Relocating this used equipment will be a service to the present owner as well as the prospective user.

"We now have in the process of publication a series of direct mail pieces designed to show how to use electrically-operated farm equipment more efficiently, and hence more economically. Instructions will also be given on how to care for and maintain such equipment, with special emphasis on small motors."

South Atlantic

"We have given the matter of a rural and farm program for 1942 serious consideration," says L. W. GRAY, Manager, Rural Sales Division, Georgia Power Company. "The program we expect to put into operation will be very similar to our previous programs, with the exception of curtailing certain activities, and emphasizing others about as follows:

"We do not contemplate construction of any rural lines during 1942, except upon a very limited basis and those confined to very short extensions, and also those lines that may be utilized for defense purposes which will require priority ratings. We plan to encourage the utilization of present equipment on hand to a fuller and better advantage, such as a more adequate water supply with the present equipment, the grinding and processing of more foodstuffs, the encouragement of home made brooders, additional lighting of henhouses, and encouragement and more extensive use of farm repairs and farm shops.

"We plan to cooperate in every way possible with the Agricultural Defense Program through the agricultural county agents and other agencies. To encourage the 'Live at Home Program,' production of more food and its adequate preservation. To encourage increased poultry and livestock production and the production of home grown foodstuffs for poultry and livestock. To encourage meat curing for farm use, better gardens, and cooperate with small agricultural industries and rural community enterprises.

"We plan to promote and assist in the development in as far as practicable, community refrigeration plants, freezer locker plants, particularly in connection with vocational schools throughout the state. Sweet potato curing and storage houses, the electric hot beds, canning plants, livestock and poultry sales, barns, small wood preserving plants for farm use and such kindred activities.

"We plan to extend our educational activities into groups, civic organizations,

rural communities and vocational schools in smaller towns. This activity will be conducted through lectures, sound-slide films and moving pictures illustrating local applications of rural and farm uses of electricity of which this company has a liberal and excellent supply."

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C. H. LEATHAM, Vice President, Monongahela West Penn Public Service Company, writes: "Our policy will be to continue our rural promotional program about on the same basis we have conducted it during the last three years. That is, a rural representative plan, with 400 to 600 rural and farm customers under the direction of one man, his duties including general operation among the 400 to 600 customers. We will emphasize ways in which electricity may supplement the farm labor shortage, and it is this approach that farmers in our territory are most interested in at this time.

"With industry taking most of the surplus employables, farm labor is becoming a real problem. It seems to us that this is an ideal time for us to render our farm customers a real service by keeping information before them relative to ways in which their electrical service can supplement this labor shortage. As an example of the effectiveness of it, more milkers have been sold in our territory in the past ten months than were sold in the previous five years. Our company publication, 'Farm Chats,' that goes to all farm customers, will use studies taken from farms within the territory, using pictures and testimonials of electrical service that is adding to the productive capacity of the farm."

East South Central

E. C. EASTER, Manager, Rural and Towns Division, Alabama Power Company, reports: "At our suggestion, the state director of extension service has called to the attention of county and home demonstration agents throughout the state that company representatives will be glad to assist any farmer receiving service from the company in the use of electric service to increase his farm production in connection with the defense program. We will, of course, keep in contact with agricultural agencies and the farm situation, and if it appears that additional electrical equipment is needed on the farms in order to meet increased production quotas, we will assist in every way possible. However, it is not our purpose to promote increased uses of electricity generally by our farm customers, even though the increased uses will increase the farmers' production, unless the uses of electricity are essential to the farm production, and the increased production is considered necessary by the agricultural authorities."

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J. J. POWELL, Residential Sales Manager, Mississippi Power & Light Company, reports: "We plan in our 1942 program to tie-in very closely with the State Extension forces in the national 'Food Will Win the War' and nutrition program through our Farm Home Representative and through our Home Service Department."

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C. W. HAGGARD, Dealer Sales, Kentucky Utilities Company, outlines his company's rural policy as follows: "We have instituted a program which provides for customer education on the proper use and care of appliances, reconditioning and service to old appliances as a defense measure, and recommending to the customer such changes as are necessary to insure the most economical and efficient use of our services.

"This program will extend to rural customers as well as to all others. Equipment sales will be routed through the dealers, who accounted for a large majority of the sales volume of appliances in 1941. The company will continue and expand its policy of dealer coordination and development.

"The local farm outlook is generally good, and places the farm market in a position most favorable for the appliance dealer."

West South Central

The objective of the 1942 farm service program of Louisiana Power & Light Company is to help win the war by: 1) Helping farm customers use their present electrical equipment in the most effective way so as to increase production (in spite of labor shortages), decrease cost, and to conserve vital materials by proper care and use of present equipment, and 2) Devoting all energies and effort to working with agricultural groups and organizations on a strictly educational basis for the purpose of disseminating *practical* information on the intelligent use of electricity on the farm and in the farm home that will help win the war.

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"We are not varying our general procedure in rural practices from the past, which has been to supply farmers with all information regarding the use of electricity," writes Roy E. Hayman, In Charge of Rural Electrification, Oklahoma Gas and Electric Company.

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G. W. PATTILLO, Superintendent, Residential Sales, Houston Lighting & Power Company, outlines his company's plans for 1942 as follows: "With the increased demand for foodstuffs, particularly dairy, poultry and livestock products, farmers in this area are being encouraged through every possible medium to increase production and it is our plan to cooperate in this movement by stressing the use of those services which contribute to increased production, as, for example, electric brooding, poultry lighting, water pumping, etc. Farmers are being encouraged to use as little critical materials as possible through substitution of wood instead of metal for brooder hovers, for example, and are being taught how to convert existing buildings to brooder and laying houses rather than constructing new houses.

"Farm representatives will encourage farmers to keep existing equipment in good repair, and to take proper care of it, in order to make it last through the emergency. Individual contacts may be reduced considerably due to the tire and automobile situation, and a greater emphasis placed on group meetings with the cooperation of vocational teachers, county agents, home demonstration agents and others."

Mountain

"Our rural sales policy will consist only of encouraging the proper use and keeping in repair of all electrical farm equipment. As far as rural extensions are concerned, very few will be made," writes W. A. HUCKINS, Sales Manager, Utah Power & Light Company.

"We still maintain a few of the sales promotional people who work through dealers. It is their duty to hold group meetings wherever possible, and in the rural territories the subject of repairs and proper use of farm equipment is discussed thoroughly at such meetings."

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G. L. STANTON, Advertising Manager, Idaho Power Company, writes: "Idaho Power Company serves an agricultural area which is mostly under irrigation, where farm crops are highly diversified and which is already largely electrified. More than 75 per cent of the farms in this area already have electric service. Many of the crops and farm products raised here require a consider-

able amount of labor, of which there is a definite shortage. For this reason electricity can play a major part in stepping up farm production, and in saving time, health and money for farmers and their families.

"In relation to the dairy industry, the following electric services are most valuable: hay chopping, feed grinding, milking by machine, providing running water, both hot and cold, barn ventilation and low pressure sterilization of milk utensils.

"Lighting, feed grinding, running hot and cold water, ventilation, brooding and ultra violet treatment are among the most valuable electric aids to poultry production. It is expected that a more widespread use of electric hog brooders will be made this year.

"Farm workshops, completely electrified, will be more important for repairs and maintenance, and individual motors will be widely used for a variety of purposes.

"The Idaho Power Company is placing emphasis this year upon a rural program which is designed to aid farm production in every way possible, particularly by increased use of present facilities to the limit of their capacities."

Pacific

"California farmers have signed up almost 100 per cent to meet the increased food quotas required by the Secretary of Agriculture in the 'Food for Freedom' campaign," writes A. M. FROST, Manager, Agricultural Sales, Pacific Gas and Electric Company. "The increases in poultry and dairy products are particularly important and will show increases of 15 per cent to 20 per cent. For example: California will produce six billion pounds of milk and one hundred and seventy million dozen eggs in 1942. Beef and hogs will also be slaughtered in greater numbers than in previous years, and hay, both alfalfa and grain, will be substantially increased in acreage. Dehydration of vegetables is coming into prominence. This dehydration program will be greatly expanded during the balance of the year and it is expected that many of the dehydrators which have formerly operated on a very low load factor for fruit drying will improve their load factor with the drying of the vegetable crops.

"The plans of the Pacific Gas and Electric Company for agricultural sales in 1942 are to carry on with our present force of thirty-odd trained rural power salesmen and twelve pump testers. Sales-

(*Continued on page* 110)

James F. Owens

JAMES F. OWENS, Chairman of the Board of the Oklahoma Gas and Electric Company, and a member of the Operating Committee of the Edison Electric Institute, died of a heart ailment on Feb. 20 at Oklahoma City.

Jack Owens, as he was known to countless friends, was born in Illinois in 1878. As a boy he was a country school teacher before he was older than some of his pupils. During his boyhood he also worked on the farm and afterward attended Kansas State Normal School and Kansas State University. For eight years he was a school teacher and principal and was well on his way toward a successful teaching career when he decided that he wanted to enter business. He secured a position with the Baldwin (Kans.) Gas Company in 1905 and soon afterward was made manager of that organization, and later was superintendent of the Caney River Gas Company.

In 1910 he became superintendent of the gas department of the Muskogee Gas and Electric Co., the position he held until 1915, when he was made superintendent of gas construction for that company. In 1916 he became manager of the company and electric light and power, as well as gas, became part of his business life. Two years later he was made vice-president and general manager of the Oklahoma Gas and Electric. In 1931 he was elected president of the company and became chairman of the board early this year.

Following a long period of activity with the National Electric Light Association in operating, public policy and administrative committee work, Mr. Owens was elected its president in 1932. His public spirit was shown by the many executive offices held by him in the Oklahoma City and state chambers of commerce during the first World War in Red Cross, Liberty Loan and other patriotic work, as well as his active participation in Boy Scout, public health, and other civic activities. In 1937 he was appointed Chairman of the Oklahoma unit of the national Advisory Committee of the New York World's Fair in 1939, in this capacity serving as liaison officer between the New York Fair organizations and the Oklahoma unit of 100 prominent citizens that has been formed to represent the legislative, civic, commercial and professional groups in the state.

Mr. Owens' great services to this and the former N.E.L.A. were memorialized in a Resolution adopted by the Operating Committee of the EEI at its meeting held early this month at Pittsburgh. The Resolution reads:

WHEREAS, the Operating Committee of the Edison Electric Institute has learned with great sorrow of the death on Feb. 20, 1942, of James Francis Owens, Chairman of the Board of the Oklahoma Gas and Electric Company and an honored member of this Committee since its formation, now, therefore,

BE IT RESOLVED: That the Operating Committee place on record its deep appreciation of the long, faithful and inspiring service of Mr. Owens in the work of the Edison Electric Institute and its predecessor, the National Electric Light Association, and its realization of the loss of an outstanding utility executive whose administration of the affairs of his own company has brought credit to the whole industry. A stalwart champion of the American system of free private enterprise, a hater of sham and hypocrisy, a faithful friend and an inspiring leader he believed in, and practiced to the fullest, cooperation for the common good. Continuously active in the affairs of the National Electric Light Association from 1916 to 1932 he gave during that period freely of his experience, counsel and time to some eleven committees, including the Constitution and By-Laws, National Executive, Rural Electric and Public Policy Committees, and the Chairmanship of the Public Relations National Section. In 1931-1932 he served with great ability and distinction as the President of the Association and continued from 1933 until his death, his long and brilliant record of Association work by service on this Committee of the Edison Electric Institute. Now in grateful remembrance of his labors with us and with the kindest memories of his friendship and his help,

BE IT FURTHER RESOLVED: That this expression of our esteem and sorrow be entered in full upon the minutes of this meeting, and that a copy thereof be transmitted to Mrs. Owens, to his sons and daughter, and to the Oklahoma Gas and Electric Company, in token of our sympathy and as evidence of our admiration and our affection for Mr. Owens.

Final Data on 1941 Operations

Statistical Bulletin No. 9 Now on Press

THE Electric Light and Power Industry in the United States in 1941—Statistical Bulletin No. 9—carrying the operating, financial and miscellaneous statistics on the industry is now on the press and will be available for distribution the first week in April.

The data given in this article are summarized from the Statistical Bulletin and supplements and slightly revises the preliminary year-end review of the industry published in the December, 1941, issue of the EEI BULLETIN:

The year 1941 brought a new record in the efficiency of operation, in the sales of energy in the several classes of service, in the enlargement of plant facilities and an increase of 1,416,370 customers connected to the lines, a growth surpassing all previous records. A severe drought in the southeast resulted in power rationing for a few weeks, but with this exception the nation's power supply during the year proved adequate to meet the war demand.

Plant Facilities

The generating capacity of the industry on Dec. 31, 1941, was 44,009,900 kw, a net increase after the retirement of some 221,500 kw, of 2,370,944 kw. The non-coincident peak load for the peak month of December, 1941, is estimated to have been 35,100,000 kw, an increase of 3,600,000 over the December peak of 1940. The excess of generating capacity over the peak load was reduced to 8,910,000 compared with 10,140,000 kw for December, 1940.

Toward the close of 1941 it became increasingly difficult, due to shortages of materials and to demands on manufacturers of turbines, particularly that of the shipbuilding program, to secure scheduled delivery of turbines and other equipment, with the result that some 900,000 kw of new capacity originally planned for 1941 was delayed until 1942. The 1942 construction, including this carry-over, amounts to 3,733,400 kw.

Generated Output

Kilowatthour generation during 1941 amounted to 168,003,100,000, an increase of 15.9 per cent. Due to the larger proportion of new generating capacity being steam driven, and to severe drought conditions, a large part of the increase was from steam plants which generated 115,254,900,000 kwhr, an increase of 20.5 per cent. During 1941 generators driven by steam turbines and engines generated an average of 3923 kw for each kilowatt installed compared with the previous high record of 3538 for 1940. The output of generators driven by water wheels and turbines was 4277 kwhr per kw compared with 4137 in 1940 and the record high of 4395 established in 1928. In 1941, production of steam in proportion to total was 68.6 per cent or a record percentage—conversely, hydro production was at its record low of 30.4 per cent. Record consumption of all types of fuels was likewise established:—coal, 64,795,000 tons up 21.3 per cent; fuel oil, 20,259,000 bbls up 20.8 per cent; and gas, 203,992,000 up 11.4 per cent. The total in total coal equivalent tons was 78,700,000 com-

SOURCE AND DISPOSAL OF ENERGY

Generation (Net)	*1941*	*1940*	%
By Fuel Burning Plants	116,874,500,000	97,231,938,000	+20.2
By Water Power Plants	51,128,600,000	47,752,627,000	+ 7.1
Total Generation	168,003,100,000	144,984,565,000	+15.9
Add—Net Imports Over Internat'l Boundaries	927,320,000	937,095,000	— 1.0
Less—Company Use	2,465,901,000	1,719,717,000	+43.4
Less—Energy Used by Producer	3,701,959,000	5,547,946,000	—33.3
Net Energy For Distribution	162,762,560,000	138,653,997,000	+17.4
Losses & Unaccounted For	22,702,401,000	20,010,700,000	+13.5
Sales to Ultimate Customers	140,060,159,000	118,643,297,000	+18.1
CLASSIFICATION OF SALES			
Number of Customers as of December 31st			
Residential or Domestic	26,025,513	24,951,906	+ 4.3
Rural (Distinct Rural Rates)	986,719	685,812	+43.9
Commercial or Industrial:			
Small Light & Power	4,299,976	4,260,255	+ .9
Large Light & Power	172,677	177,905	— 2.9
Street & Highway Lighting	24,932	24,147	+ 3.3
Other Public Authorities	95,948	89,480	+ 7.2
Railways and Railroads:			
Street & Interurban Railways	194	198	— 2.0
Electrified Steam Railroads	31	27	....
Interdepartmental	1,381	1,271	+ 8.7
Total Ultimate Customers	31,607,371	30,191,001	+ 4.7
Kilowatthours Sold			
Residential or Domestic	25,123,900,000	23,317,569,000	+ 7.7
Rural (Distinct Rural Rates)	2,351,653,000	1,990,908,000	+18.1
Commercial or Industrial:			
Small Light & Power	24,627,985,000	22,373,336,000	+10.1
Large Light & Power	76,060,536,000	59,556,667,000	+27.7
Street & Highway Lighting	2,110,444,000	2,048,118,000	+ 3.0
Other Public Authorities	3,093,337,000	2,720,314,000	+13.7
Railways and Railroads:			
Street & Interurban Railways	3,959,817,000	3,974,277,000	— .4
Electrified Steam Railroads	2,118,238,000	1,935,484,000	+ 9.4
Interdepartmental	614,249,000	726,624,000	—15.5
Total to Ultimate Customers	140,060,159,000	118,643,297,000	+18.1
Revenue			
Residential or Domestic	$938,228,600	$895,951,400	+ 4.7
Rural (Distinct Rural Rates)	64,395,600	49,473,400	+30.2
Commercial or Industrial:			
Small Light & Power	725,117,400	689,253,000	+ 5.2
Large Light & Power	758,082,700	631,428,000	+20.1
Street & Highway Lighting	76,949,200	76,051,900	+ 1.2
Other Public Authorities	49,202,800	45,515,300	+ 8.1
Railways and Railroads:			
Street & Interurban Railways	32,471,500	32,739,800	— .8
Electrified Steam Railroads	16,473,700	15,067,600	+ 9.3
Interdepartmental	4,135,500	4,737,100	—12.7
Revenue from Ultimate Customers	$2,665,057,000	$2,440,217,500	+ 9.2

CHANGES IN GENERATING PLANT CAPACITY DURING 1941 AND SCHEDULED ADDITIONS FOR 1942 (DATA IN KILOWATTS)

Type of Prime Mover	Generating Capacity on Dec. 31, 1940	Gross Additions During 1941	Capacity Retired	Changes in Ratings or Ownership	Generating Capacity on Dec. 31, 1941	Scheduled Additions for 1942
Total for All Plants Contributing to Public Supply						
Steam Turbines	29,019,102	1,918,222	199,912	+39,988	30,777,400	2,557,400
Water Wheels	11,675,300	559,156	12,163	+10,207	12,232,500	1,113,700
Internal Combustion	944,554	62,017	9,470	+ 2,899	1,000,000	62,300
Total	41,638,956	2,539,395	221,545	+53,094	44,009,900	3,733,400
Private Electric Utilities						
Steam Turbines	25,550,975	1,731,865	141,952	−16,588	27,124,300	2,166,100
Water Wheels	8,468,840	31,381	8,830	− 991	8,490,400	104,600
Internal Combustion	378,761	15,296	7,333	− 7,524	379,200	10,800
Total	34,398,576	1,778,542	158,115	−25,103	35,993,900	2,281,500
Municipal Electric Utilities						
Steam Turbines	1,820,251	161,182	30,890	+ 5,257	1,955,800	195,800
Water Wheels	664,153	4,200	1,843	− 110	666,400	5,300
Internal Combustion	492,324	37,038	1,648	+ 886	528,600	40,100
Total	2,976,728	202,420	34,381	+ 6,033	3,150,800	241,200
Governmental Power Districts						
Steam Turbines	284,156	22,750	1,570	+51,364	356,700	195,500
Water Wheels	2,042,268	522,830	590	+10,692	2,575,200	1,003,800
Internal Combustion	52,272	8,021	440	+ 9,547	69,400	11,400
Total	2,378,696	553,601	2,600	+71,603	3,001,300	1,210,700
Other Plants Contributing to the Public Supply						
Steam Turbines	1,363,720	2,425	25,500	− 45	1,340,600	.....
Water Wheels	500,039	745	900	+ 616	500,500	.....
Internal Combustion	21,197	1,662	49	− 10	22,800	.....
Total	1,884,956	4,832	26,449	+ 561	1,863,900	.....

pared with 65,136,000 tons in 1940, an increase of 20.8 per cent.

Energy Sales

Despite the record number of new customer additions and record sales for all types of home appliances, the present increase in kilowatthour sales to residential and domestic customers is less than has obtained for the past several years, showing a gain of 8.6 per cent for 1941 over 1940. Sales to small light and power customers was slightly above those of the recent past at 10.1 per cent. Phenomenal increases were shown in industrial or large light and power sales. For the industry as a whole the sales amounted to 76,060,536,000 kwhr compared with 59,556,667,000 in 1940, an increase of 27.7 per cent. Even at this high level the sales to these larger customers were smaller in proportion to the total sales than in 1929, amounting to 54.3 per cent of the total sales in 1941 compared with 57.1 per cent in 1929. Large light and power sales increased 33.2 per cent in the New England States; 24.2 per cent for the Middle Atlantic; 28.8 per cent in the industrial states bordering the Great Lakes; 31.6 per cent in agricultural states of the Middle West; over 25 per cent in the Southern States despite the unusual drought conditions; only 10.5 per cent in the Rocky Mountain States, but 49.1 per cent in the Pacific Coast States.

Farm Service

The close of 1941 found 2,352,603 or 38.5 per cent of the country's farms receiving electric service from power lines and about 180,000 or 2.9 per cent with home lighting plants or a grand total of over two and a half million farms (41.5 per cent) now with electrically lighted homes. It is estimated that there are approximately 500,000 farms located within one-quarter mile of distribution lines not taking service for divers reasons. Roughly, 50 per cent of American farms either have electric service or have it available to them. The 1941 figures indicate the average Eastern farm now uses over 100 kwhr per month. Fewer farms will be connected in the immediate future, but the increased usage per customer on the farms now connected will no doubt result in lowering the present average cost of 4.20 cents per kwhr.

Average Customer Data

Residential or Domestic Service increased only 34 kwhr per customer, but is rapidly approaching 1000 per customer, being 986 kwhr for each customer for 1941. The large increase in the number of customers amounting to 1,073,607 during the year, many of them comparatively small users, undoubtedly has had some influence on this small increased use per customer. The average price in 1941 was 3.73 cents compared with 3.84 cents in 1940. Higher taxes and operating costs, together with the lower relative increase in consumption per customer, have lessened somewhat the 20-year downward sweep of average rates. Based on 1914 equals 100, the index for the cost of electricity stood 42.9 compared with 155.5 for the cost of living on the same base.

Small Light & Power Service made a record increase in usage per customer, increasing to 5,754 kwhr compared with

5280, an increase of 475 kwhr—the largest change in any year for the period 1926 to date. The average revenue per kilowatthour for this class broke through the three cent mark to 2.94 cents compared with 3.08 cents in 1940.

Large Light & Power Service was distributed at 1.00 cents per kwhr in 1941 compared with 1.06 cents in 1940. A large factor contributing to the low average rate for large light and power service has been the large amount of energy going to the production of chemicals, aluminum and other non-ferrous metals.

The total for all classes amounted to 4535 kwhr per customer, a record increase of 537 kwhr per customer and the average revenue per kilowatthour dropped below the 2 cent mark for the first time to 1.90 cents per kwhr.

1942 Budget

In 1941 the private utilities spent $591,900,000 for new construction and the municipal and governmental plants $277,700,000 or a total of $869,600,000 —the same as the budgeted figure of $870,000,000 scheduled for that year. For 1942 the private utilities plan to spend $622,000,000 and the municipal and governmental plants $448,000,000 or a total budget of $1,070,000,000. Many of these budget figures were prepared prior to the restrictive measures of the War Production Board and as a result of scarcity of materials and equipment, the figures for 1942 may prove higher than the actual expenditures. This is particularly true of the some $287,000,000 budgeted for distribution lines in 1942 compared with the $318,500,000 expended in 1941, although some may be transferred to the $536,000,000 scheduled for generating facilities. Budget figures for transmission lines and substations are about double the amount spent for these facilities last year, amounting to $212,000,000 for 1942.

Revenue and Expenses

The revenue of the private companies in 1941 amounted to $2,475,000,000, an increase of $198,000,000 or 8.7 per cent for the year. Taxes, depreciation and operating expenses including fuel and labor were up $218,000,000, producing a decrease of $20,000,000 in electric operating income for the year. A net saving of $12,000,000 in interest and amortization was offset by a reduction of $10,000,000 in income from other departments and in non-operating income, with the result that the net in-

AVERAGE ANNUAL KILOWATTHOUR SALES AND BILL PER CUSTOMER, AND REVENUE PER KILOWATTHOUR, 1926-1941

Year	AVERAGE KILOWATTHOURS PER CUSTOMER				AVERAGE ANNUAL BILL PER CUSTOMER			
	Residential or Domestic	Commercial and Industrial Small	Commercial and Industrial Large	Total Ultimate Customers	Residential or Domestic	Commercial and Industrial Small	Commercial and Industrial Large	Total Ultimate Customers
		New Classification				*New Classification*		
1941	986	5,754	433,910	4,535	$36.78	$169	$4,339	$86.17
1940	952	5,280	328,857	3,998	36.56	163	3,486	82.35
1939	897	4,968	271,839	3,702	35.88	158	3,045	79.96
1938	853	4,668	221,811	3,392	35.31	154	2,662	78.03
1937	805	4,578	215,215	3,711	34.62	156	2,453	80.53
		Old Classification				*Old Classification*		
1936	735	4,143	166,452	3,504	$34.30	$149	$1,981	$79.54
1935	677	3,682	130,118	3,113	33.92	141	1,692	76.58
1934	629	3,368	112,267	2,916	33.51	134	1,516	75.23
1933	600	3,208	95,989	2,768	33.12	131	1,325	73.63
1932	601	3,304	86,121	2,650	33.70	137	1,318	75.53
1931	583	3,686	106,295	2,943	33.68	154	1,563	80.93
1930	547	3,863	112,335	3,076	32.98	160	1,584	81.82
1929	502	3,681	121,153	3,191	31.78	156	1,672	82.01
1928	463	3,397	115,348	2,970	30.73	151	1,615	79.00
1927	446	3,307	116,010	2,929	30.42	148	1,694	79.38
1926	430	3,119	115,515	2,900	30.10	141	1,721	78.59

AVERAGE REVENUE PER KILOWATTHOUR

Year	Residential or Domestic	Commercial and Industrial Small	Commercial and Industrial Large	Street and Highway Lighting	Other Public Authorities	Railways and Railroads Street and Interurban	Railways and Railroads Electrified Railroads	Total Ultimate Customers
					New Classification			
1941	3.73¢	2.94¢	1.00¢	3.65¢	1.59¢	0.82¢	0.78¢	1.90¢
1940	3.84	3.08	1.06	3.71	1.67	0.82	0.78	2.06
1939	4.00	3.19	1.12	3.77	1.61	0.83	0.78	2.16
1938	4.14	3.30	1.20	3.85	1.64	0.84	0.83	2.30
1937	4.30	3.41	1.14	3.91	1.61	0.84	0.84	2.17
					Old Classification			
1936	4.67¢	3.60¢	1.19¢	3.64¢	1.90¢	0.85¢	0.86¢	2.27¢
1935	5.01	3.82	1.30	3.82	1.89	0.87	0.95	2.46
1934	5.33	3.99	1.35	4.32	2.02	0.86	0.96	2.58
1933	5.52	4.07	1.38	4.39	2.08	0.88	1.00	2.66
1932	5.60	4.14	1.53	4.42	1.95	0.91	1.09	2.85
1931	5.78	4.17	1.47	4.26	2.22	0.92	1.07	2.75
1930	6.03	4.13	1.41	4.29	2.44	0.92	1.02	2.66
1929	6.33	4.24	1.38	4.33	2.51	0.92	1.01	2.57
1928	6.63	4.45	1.40	4.34	2.46	0.93	0.99	2.66
1927	6.82	4.48	1.46	4.44	2.20	0.95	1.03	2.71
1926	7.00	4.51	1.49	4.28	2.87	0.96	1.03	2.71

FARM ELECTRIFICATION DATA BY STATES

State	Number of Farms	Dwellings Within 1/4 Mile Distribution Line Number	%	Dwellings Lighted by Electricity — U. S. Census Data as of April 1, 1940 — Total Electrified Number	%	Home Plants Number	%	EEI Data — Number and % on Power Lines (April 1, 1940) Number	%	(Dec 31, 1940) Number	%	(Dec 31, 1941) Number	%
Total United States	6,096,799	2,780,207	45.6	2,032,316	33.3	179,067	2.9	1,853,249	30.4	2,069,759	33.9	2,352,603	38.6
Maine	38,980	24,160	62.0	21,124	54.2	903	2.3	20,221	51.9	21,246	54.5	22,721	58.3
New Hampshire	16,554	12,374	74.7	11,184	67.6	339	2.1	10,845	65.5	11,616	70.2	12,810	77.4
Vermont	23,582	14,855	63.0	12,873	54.6	660	2.8	12,213	51.8	13,103	55.6	14,722	62.4
Massachusetts	31,897	28,043	87.9	26,648	83.5	420	1.3	26,220	82.2	26,757	83.9	27,520	86.3
Rhode Island	3,014	2,644	87.7	2,511	83.3	54	1.8	2,457	81.5	2,497	82.8	2,552	84.7
Connecticut	21,163	18,542	87.6	17,494	82.7	499	2.4	16,995	80.3	17,304	81.8	18,072	85.4
Total New England	*135,190*	*100,618*	*74.4*	*91,834*	*67.9*	*2,883*	*2.1*	*88,951*	*65.8*	*92,523*	*68.4*	*98,397*	*72.8*
New York	153,238	115,879	75.6	106,804	69.7	4,521	3.0	102,283	66.7	106,531	69.5	113,121	73.8
New Jersey	25,835	23,056	89.2	21,695	84.0	397	1.6	21,298	82.4	21,632	83.7	22,979	88.9
Pennsylvania	169,027	121,282	71.8	98,937	58.5	4,856	2.9	94,081	55.6	101,095	59.8	112,095	66.3
Total Middle Atlantic	*348,100*	*260,217*	*74.8*	*227,436*	*65.3*	*9,774*	*2.8*	*217,662*	*62.5*	*229,258*	*65.9*	*248,195*	*71.0*
Ohio	233,783	170,897	73.1	143,436	61.4	5,756	2.5	137,680	58.9	149,563	64.0	163,767	70.1
Indiana	184,549	123,662	67.0	95,575	51.8	4,448	2.4	91,127	49.4	106,185	57.5	123,656	67.0
Illinois	213,439	114,088	53.5	87,611	41.0	7,584	3.5	80,027	37.5	95,293	44.6	112,151	52.5
Michigan	187,589	153,042	81.6	133,095	71.0	1,969	1.1	131,126	69.9	136,546	72.8	144,675	77.1
Wisconsin	186,735	126,287	67.6	95,158	51.0	7,602	4.1	87,556	46.9	94,188	50.4	101,863	54.5
Total East North Central	*1,006,095*	*687,976*	*68.4*	*554,875*	*55.1*	*27,359*	*2.7*	*527,516*	*52.4*	*581,775*	*57.8*	*648,112*	*64.2*
Minnesota	197,351	80,220	40.6	59,838	30.3	9,763	4.9	50,075	25.4	55,736	28.2	69,176	35.1
Iowa	213,318	107,359	50.3	86,786	40.7	13,478	6.3	73,308	34.4	89,103	41.8	108,517	50.9
Missouri	256,100	74,035	28.9	45,355	17.7	6,151	2.4	39,204	15.3	49,671	19.4	61,093	23.9
North Dakota	73,962	7,310	9.9	11,446	15.5	8,228	11.1	3,218	4.4	4,047	5.5	4,726	6.4
South Dakota	72,454	8,444	11.7	12,845	17.7	8,864	12.2	3,981	5.5	4,518	6.2	5,983	8.3
Nebraska	121,062	40,969	33.8	34,886	28.8	12,054	9.9	22,832	18.9	27,259	22.5	30,196	24.9
Kansas	156,327	45,067	28.8	41,549	26.6	13,589	8.7	27,960	17.9	31,683	20.3	34,584	22.1
Total West North Central	*1,090,574*	*363,404*	*33.3*	*292,705*	*26.8*	*72,127*	*6.6*	*220,578*	*20.2*	*262,017*	*24.3*	*314,275*	*28.8*
Delaware	8,994	6,096	67.8	3,699	41.1	154	1.7	3,545	39.4	4,348	48.3	4,815	53.5
Maryland	42,110	23,700	56.3	18,351	43.6	1,234	3.0	17,117	40.6	18,539	44.0	21,925	52.1
District of Columbia	65	60	92.3	54	83.0	1	1.5	53	81.5	53	81.5	53	81.5
Virginia	174,885	77,255	44.2	44,348	25.4	2,204	1.3	42,144	24.1	47,056	26.9	54,712	31.3
West Virginia	99,282	36,958	37.2	26,735	26.9	1,536	1.5	25,199	25.4	27,922	28.1	30,041	30.3
North Carolina	278,276	124,017	44.6	71,196	25.6	3,569	1.3	67,627	24.3	77,414	27.8	95,887	34.5
South Carolina	137,558	56,731	41.2	28,764	20.9	1,196	0.9	27,568	20.0	37,382	27.2	45,944	33.4
Georgia	216,033	88,427	40.9	43,958	20.3	1,549	0.7	42,409	19.6	53,683	24.8	65,241	30.2
Florida	62,248	25,063	40.3	16,472	26.5	996	1.6	15,476	24.9	16,403	26.4	18,346	29.5
Total South Atlantic	*1,019,451*	*438,307*	*43.0*	*253,577*	*24.9*	*12,439*	*1.2*	*241,138*	*23.7*	*282,800*	*27.7*	*336,964*	*33.1*
Kentucky	252,894	79,740	31.5	42,288	16.7	3,681	1.4	38,607	15.3	44,372	17.5	52,693	20.8
Tennessee	247,617	74,276	30.0	40,519	16.4	1,635	0.7	38,884	15.7	42,676	17.2	50,355	20.3
Alabama	231,746	77,579	33.5	35,725	15.4	1,818	0.8	33,907	14.6	43,440	18.7	49,857	21.5
Mississippi	291,092	85,647	29.4	27,670	9.5	1,592	0.5	26,078	9.0	29,059	10.0	36,823	12.6
Total East South Central	*1,023,349*	*317,242*	*31.0*	*146,202*	*14.3*	*8,726*	*0.9*	*137,476*	*13.4*	*159,547*	*15.6*	*189,728*	*18.5*
Arkansas	216,674	58,732	27.1	23,435	10.8	2,132	1.0	21,303	9.8	26,026	12.0	31,038	14.3
Louisiana	150,007	46,694	31.1	17,187	11.5	1,129	0.8	16,058	10.7	18,262	12.2	20,693	13.8
Oklahoma	179,687	43,128	24.0	28,280	15.7	8,131	4.5	20,149	11.2	23,369	13.0	30,583	17.0
Texas	418,002	147,349	35.3	93,577	22.4	14,450	3.5	79,127	18.9	93,474	22.4	116,204	27.8
Total West South Central	*964,370*	*295,903*	*30.7*	*162,479*	*16.8*	*25,842*	*2.7*	*136,637*	*14.2*	*161,131*	*16.7*	*198,518*	*20.6*
Montana	41,823	10,614	25.4	11,688	27.9	3,741	8.9	7,947	19.0	8,745	20.9	10,028	24.0
Idaho	43,663	28,931	66.3	26,384	60.4	945	2.1	25,439	58.3	28,801	66.0	31,790	72.8
Wyoming	15,018	4,655	31.0	5,184	34.5	1,710	11.4	3,474	23.1	3,954	26.3	4,578	30.5
Colorado	51,436	20,046	39.0	19,735	38.4	4,912	9.6	14,823	28.8	16,648	32.4	20,039	39.0
New Mexico	34,105	7,644	22.4	6,554	19.2	2,075	6.1	4,479	13.1	4,834	14.2	5,715	16.5
Arizona	18,468	6,577	35.6	6,031	32.7	424	2.3	5,607	30.4	6,191	33.5	6,672	36.1
Utah	25,411	18,510	72.8	17,714	69.7	303	1.2	17,411	68.5	18,478	72.7	19,367	76.2
Nevada	3,573	1,770	49.5	1,812	50.7	257	7.2	1,555	43.5	1,599	44.8	1,623	45.4
Total Mountain	*233,497*	*98,747*	*42.3*	*95,102*	*40.7*	*14,367*	*6.1*	*80,735*	*34.6*	*89,250*	*38.2*	*99,812*	*42.7*
Washington	81,686	62,843	76.9	60,082	73.6	1,799	2.2	58,283	71.4	61,885	75.8	66,335	81.2
Oregon	61,829	41,245	66.7	38,010	61.5	1,641	2.7	36,369	58.8	39,519	63.9	42,491	68.7
California	132,658	113,705	85.7	110,014	82.9	2,110	1.6	107,904	81.3	110,054	83.0	111,776	84.3
Total Pacific	*276,173*	*217,793*	*78.9*	*208,106*	*75.4*	*5,550*	*2.0*	*202,556*	*73.3*	*211,458*	*76.6*	*220,602*	*79.9*

come for 1941 was only $539,000,000 compared with $557,000,000 in 1940, a decrease of $18,000,00 or 3.2 per cent.

(Figures in Millions)

	1941 $	*1940* $	*Change* $
Gross Operating Revenue (Electric)	2,475	2,277	+198
Operating Expenses	955	863	+ 92
Depreciation	279	260	+ 19
Taxes	511	404	+107
Total Revenue Deductions	1,745	1,528	+218
Operating Income—Electric	730	750	— 20
Operating Income—Other Depts.	55	62	— 7
Non-operating income	74	77	— 3
Gross Corporate Income	859	889	— 30
Interest and Amortization	303	315	— 12
Other Income Deductions	17	17	....
Net Income	539	557	— 18

The briefed income statement for 1941 and 1940 in the preceding column presents a columnar comparison of these changes.

Taxes

Electric utility taxes rose in 1941 by over 26 per cent, reaching the highest point in the history of the industry. Taxes now take one dollar out of every five collected from consumers. Total taxes approximated $511,000,000, as compared with a revised figure of $404,000,000 for 1940. The government has now become the senior partner in electric utility enterprises and takes in taxes more than is received either by labor or by the owners of the property.

Almost all of the 1941 tax rise has taken place in federal taxation, largely the result of the increase in the normal income tax rate and because of the method of calculating the "excess profits" tax. Based upon reports covering about 70 per cent of total revenues, the distribution of the taxes for all of the electric utility companies of the country during the last two years was approximately as follows:

Federal Taxes	*1941* *(Millions of Dollars)*	*1940*
Income taxes	180	129
Excess profits	45	6
3 1/3 excise tax	49	44
All other Federal	20	11
Total Federal	294	190
State & local taxes	217	214
Total taxes	511	404

Accident Prevention Committee Meeting

George S. Diehl, *Chairman*

THE winter meeting of the Accident Prevention Committee was held at the William Penn Hotel, Pittsburgh, Feb. 23 and 24. Most of the program was devoted to papers and discussions having a direct bearing on defense problems.

The change in the basis of collecting employee accident statistics was explained. The Edison Electric Institute, as well as the National Electric Light Association, had for many years collected employee accident statistics on the basis of Days Lost Per 100 Employees Per Year, Lost Time Accidents Per 100 Employees Per Year, and Fatalities Per 1000 Employees Per Year.

At the meeting of the Committee held in New York last October, the Committee recommended changing from this method of collecting statistics to the method set forth in ASA Standard Z16.1-1937. The Operating Committee subsequently approved this recommendation, and a form meeting the requirements of the new plan has been prepared and distributed to companies supplying statistics on the electric light and power industry. The data collected in this way will thus be comparable to those collected by others for this industry, and also to similar statistics in other industries.

Mr. Kreh reported the preliminary accident statistics which he had collected from members of the Committee for 1941, in response to a communication sent to members of the Committee, asking for the "Days Lost, Lost Time, and Fatal Accidents." On the basis of replies covering 112,833 employees, the ratios were as follows:

36.5 Days Lost Per 100 Employees Per Year
1.9 Lost Time Accidents Per 100 Employees Per Year
.36 Fatalities Per 1000 Employees Per Year

Mr. Kreh reported on the "Recommended Practice for Analyzing Accidents in the Electric Light and Power Industry," which was sent to members of the Committee under date of Feb. 6, with the request that it be used to classify as many accidents as possible to test its adaptability to our industry. The response to this request indicated that this recommended practice can be used to advantage, although some further work is necessary before it is offered for general use.

The proposed Merit Award for outstanding accomplishment in accident prevention among employees of electric light and power companies was reported upon, and a final recommendation was made by the Committee that the award be authorized. The purpose of the award will be to give recognition to any member company, or a division or a unit of such a company, when it reports one million or more consecutive man-hours worked without a disabling injury.

Mr. Stewart presented a paper on the "Avoidance of Accidents During Electric Station Blackouts." Mr. Stewart classified the various kinds of accidents that might be expected under blackout conditions in or about an electric station. He mentioned the need for proper use of first-aid equipment and the consideration that should be given to wearing apparel, in order that as many accidents as possible might be avoided.

Mr. Webb reported on "State and Highway Safety," under ordinary and also under blackout conditions. In many localities, such matters are controlled by local ordinances, and utility vehicles will probably be subject to the same restrictions as other traffic.

Mr. Webb also reported on the response to a form sent to members of the Committee, asking for opinions concerning the guarding of a line truck and working crew on a highway. Replies received from 17 states and Canada illustrated that opinions on this subject, even for the specific conditions illustrated in his inquiry, vary over a wide range, and therefore will make it difficult to recommend a standard practice. Mr. Webb explained that there is no intention of preparing rules on this subject, but he was collecting information from which basic suggestions might be prepared.

Through the courtesy of Mr. Rakestraw, the Committee saw two motion pictures that were of particular interest. One was a film made by his company in cooperation with the Cleveland Fire Department, and the other was a film furnished by the Associated Factory Mutual Fire Insurance Companies. Both films illustrated the proper procedure in combating incendiary bombs, and the use of fire extinguishing equipment.

Mr. Smith reported that the Resuscitation Review Board had acted on all cases that had come to its attention, some cases, however, lack essential information. He reported that while pole top resuscitation has been used on about 50 cases, the Resuscitation Review Board has received data on about 30 cases only.

Mr. Smith said that while the Resuscitation Review Board was of the opinion that the pole top method of resuscitation has merit, it desires to study the matter further, and get more definite results and more complete data before arriving at final conclusions. He felt that the Committee would soon need to prepare some suggested instructions regarding the technique in applying this method of resuscitation, which would include the necessary precaution about approaching the victim, and guidance against the misuse of this method.

An evening session was held on February 23, at which time there was a round table discussion on subjects relating to blackouts and the possibility of accidents that might be due to reduced lighting. The Chairman cautioned against the formation of too definite a plan, as conditions will change as time goes on, and the safety situation should be consistent with improved methods that develop for blacking out stations and substations, and methods for extinguishing the various kinds of fires that may occur.

There was an interesting discussion on the use of protective clothing for use in congested stations or substations. Some companies now provide their operators with some form of protective clothing, for use about stations and substations, when required to approach within the vicinity of equipment where arcing may occur.

There was also a discussion with reference to the use of safety shoes. These appear to be coming into wider use, and experience indicates that several of the present designs are proving satisfactory. The use of fibre helmets and goggles in connection with safe working conditions were also discussed.

There was a discussion with reference to the use of live line maintenance tools, their care when not in use, and the tests necessary to insure their proper protective condition.

On the second day of the meeting, T. R. Claffy gave an interesting discussion on "The Rubber Protective Equipment Situation." Most of Mr. Claffy's remarks dealt with the necessity for a high quality of rubber being available for gloves, pigs, blankets, and line hose. He also supplied information concerning the general rubber situation in this country, and the need for conserving it for those purposes where it is essential. Mr. Claffy stated that some of the larger utility companies were not favorably inclined toward the repairing of rubber protective equipment. In view of the present situation, Mr. Claffy suggested that all discarded rubber protective equipment be laid aside for a later selection of the best pieces, and to have repairs made upon them if new supplies are not readily obtainable. He stressed the point that should repairs become necessary, this should be done by cementing or vulcanizing rubber patches over the injured parts, and that this work be done only by competent workmen who understand the technique in repairing rubber goods. He pointed out that line hose and insulators do not lend themselves readily to home-made repairs, as the injuries are usually so severe that factory equipment is necessary to do a satisfactory job.

Mr. Godwin read a statement made by H. B. Wilson, who represented a manufacturer of tools used in the electric utility industry. This brought out the shortage of certain materials, and the substitutes that had been considered in order to make the necessary tools and equipment available. According to Mr. Wilson, the actual tonnage of metals involved is relatively small when compared with the actual needs, and it was his opinion that with proper safeguards to prevent waste and hoarding, the requirements of the electrical industry would not be cut off in the program to conserve metals for defense purposes. He thought the manufacturers of hand tools as an industry, will probably find their capacity absorbed by government demands for the balance of this year, and by capacity he did not refer to ordinary one-shift operations, but to three-shift operation, with all that this entails. It is expected that the government will take a large volume which will inevitably limit the supply of similar tools to industries such as power companies who use them regularly in their company operation.

Mr. Sprinkle reported on the proposed Accident Prevention Handbook, which is now in the preliminary survey stage. Demands of the war are making it difficult to give prompt and immediate at-

Oklahoma Line Crew Awarded Institute Medal

Left to right: Clarence E. Holloway; Aubrey Harris; Mack Heiserman, the injured man; Joseph Barnett; E. O. Srader and J. E. Spillers, foreman

ONE morning last May, an Oklahoma Gas & Electric Company lineman's life hung by the slightest possible balance between life and death for several seconds. Then, because of fellow workers' trigger-swift thought and action, the balance shifted from death to life and the spark so nearly extinguished kindled again into life's flame.

On the evening of Feb. 18, 1942, the dramatic story of how J. E. Spillers and his line crew saved the life of Mack R. Heiserman by pole top resuscitation was reviewed as the men received awards from the Edison Electric Institute and from their own company presented by their President, George Ade Davis.

It was the occasion of the company's annual recognition service, held at the Shrine Auditorium, Oklahoma City. President Davis presented to the crew the Edison Electric Institute Resuscitation Medal and Certificate and also the Institute's medal and certificate to each member, J. E. Spillers, E. O. Srader, Joe Barnett, Aubrey Harris, and Clarence Holloway. Also present on the stage was Mack R. Heiserman, the man whose life they saved, whose empty right sleeve attested to his narrow escape from death. (Presentation of the Medal was reported in last month's issue of the BULLETIN, but the photograph and additional facts relating to the presentation arrived too late for inclusion in that issue.)

The resuscitation, which took place May 28, 1941, at Drummond, Oklahoma, was a striking example of quick thinking and perfect coordination on the part of five men, who, two years previously, had been trained in what, at that time, was an almost unknown method of artificial respiration.

The pole top method of artificial respiration was developed in the Duquesne Light Company, Pittsburgh, Pennsylvania, in order to save those vital seconds which were usually consumed in letting a lineman down from the pole to the ground, so that the standard prone pressure method could be applied. How valuable these seconds are is illustrated in the present instance by the fact that Heiserman was successfully resuscitated and remained alive despite the fact that he received enough current from a 7200 volt line passing through his body from the right hand to the right thigh, to destroy the hand and arm so that amputation at the shoulder became necessary because of gangrene.

tention to such work, but Mr. Sprinkle was of the opinion that this publication would be completed as quickly as circumstances will permit.

Mr. Davies gave an interesting paper on priorities for safety equipment as they concern the electric utilities. Mr. Davies told of the difficulty in obtaining some of the critical materials that heretofore had been considered essential in the manufacture of respirators, service gas masks, and fire extinguishing equipment. He stressed the need for taking the best care of the equipment on hand, in order to avoid the necessity for purchasing additional equipment while manufacturers are finding it extremely difficult to supply the demand.

Mr. Gilliland gave a talk on gas and incendiary bombs, which included an interesting discussion of the various kinds of incendiary materials and bombs that have been used, and description of the protective steps which have proven effective.

An interesting paper which was followed by a motion picture film, was given by J. A. McGuckin, of the Philadelphia Electric Company, on the training of employees in the extinguishment of ordinary fires, oil fires, electric fires, and aerial incendiary bombs.

A Spring meeting of the Committee will be held concurrently with the group meetings of the Engineering Committees, during the week of May 3, in Chicago.

Winners in Water Heater Display and Home Lighting Contests

WINNERS of the Fall, 1941, Water Heater Window Display and Floor Display Contests sponsored by the Modern Kitchen Bureau have been announced by the Bureau.

Gulf States Utilities Company, Beaumont, Texas, won first place in the Electric Water Heater Window Display Contest. Brice L. Pettie submitted the display, and received the First Prize of $100.

The Electric Power Board of Chattanooga, Tenn., was named as winner of the Second Prize, and the cash award of $50 went to C. B. Osborne. Ten other companies received third prizes.

Mr. Pettie's display employed three small shadow boxes, each with animated characters who emphasized one particular advantage of electric water heating. Donald Duck, MKB's popular figure, appeared in the center of the display. A continuous stream of hot water appeared to pour from two large faucets.

Colors used were royal and turquoise blue, white, orange and black.

The companies receiving third prizes, and the men who entered the displays, are:

The Connecticut Light & Power Co., Niantic, Conn., J. T. Sherlock.
Georgia Power Co., Atlanta, Ga., R. D. Benson.
Indianapolis Power & Light Co., Indianapolis, Ind., James A. Carvin.
Minnesota Power & Light Co., Duluth, Minn., R. E. Anderson.
Ohio Edison Co., Springfield, Ohio, Alexander J. Plewes.
The Ohio Power Co., Tiffin, Ohio, D. N. Merrell.
Public Service Co. of Colorado, Denver, Colo., C. F. Warmoll.
Southern Colorado Power Co., Pueblo, Colo., E. C. Alexander.
Wisconsin Electric Power Co., Milwaukee, Wis., Robert F. Miller.
Wisconsin Public Service Corp., Green Bay, Wis., D. Remington.

Judges in this contest were John J. Behr, Martelle Exhibits, Inc., F. K. Hejka, F. K. Hejka Exhibit Service, and W. A. Powers, Art Director, The Ralph H. Jones Co., all of New York City.

The Modern Kitchen Bureau's spring of 1942 electric water heater window display contest will offer another $250 in cash prizes for winning displays.

Floor Display Contest

THE Portsmouth, Ohio, district of The Ohio Power Company received First Prize in the Electric Water Heater Floor Display Contest. R. W. Moore entered the display in the contest, and received the cash award of $100.

The Hartford Electric Light Company, Hartford, Conn., won the Second Prize, with the cash award of $50 going to Ernest I. Roth.

Mr. Moore's display featured Donald Duck and his three nephews, popular Bureau characters, in action poses, with the message, "When Low Cost Luxury Is Your Goal, Go Electric!" The safety, cleanliness and convenience of electric water heating were pointed out in brightly colored hand lettering. An actual size water heater was used.

Mr. Roth's second prize winning display created the illusion of a perpetual stream of hot water flowing from a giant size faucet, with the message, "An endless supply of hot water to all faucets." The internal workings of an electric water heater were shown, to dramatize its simple operation. A smaller card told the passerby: "Hot Water by Wire—3c. per day per person!"

Judges in the water heater floor display contest were John J. Behr, Martelle Exhibits, Inc., F. K. Hejka, F. K. Hejka Exhibit Service, and W. A. Powers, Art Director, The Ralph H. Jones Company, all of New York City.

Home Lighting Contest

THE Puget Sound Power & Light Company, Seattle, Wash., is the winner of the First Award of $500 in the Home Lighting Contest for the last six months of 1941, sponsored by the Home Lighting Committee of Edison Electric Institute.

The Second Award of $200 was won by Kentucky Utilities Company, Lexington, Ky., and the Third Award of $100 by Nebraska Power Company, Omaha, Neb.

Four awards of $50 each were received by West Penn Power Company, Pittsburgh, Pa.; Ohio Public Service Company, Cleveland, Ohio; Kansas Gas & Electric Company, Wichita, Kan., and Public Service Electric & Gas Company, Newark, N. J.

The contest covered sales of I.E.S. lamps and other portables, Pin-to-Wall lamps, lighting fixtures, adapters, converters and modernizers, all equipped with proper size bulbs.

Entries were judged on the basis of Plans and Methods, including thoroughness of sales programs and training, ingenuity of sales promotion and advertising, and scope of activities. Operations and Results, including the effectiveness with which plans were executed, unit sales in relation to total domestic customers and load building value of types of equipment sold, were also considered by the judges.

The committee points out that as a result of this contest, more than 273,000 American homes are now equipped with some kind of improved lighting. That many families are now enjoying Better Light for Better Sight, and the equipment sold will help to keep their eyes in good condition for the strenuous days ahead.

Judges in the contest were Virginia Grimes, of *Retailing Magazine:* James M. Nelson, vice-president, The Ralph H. Jones Company, and C. W. Cleworth, *Electrical Publications*, all of New York City.

Salvage and Reclamation Operations

(*Continued from page* 82)

is saved in all lengths and sizes. Short pieces formerly disposed of as scrap are now saved and used to make nipples or issued where short sections are required in construction. Removed pipe, fittings, valves of all types, and bolts are cleaned, inspected, rehabilitated if necessary and either returned to stock or held for future use. A considerable sum of money may be saved by reconditioning valves which have been removed from service. Gate and globe valves may be reseated in place without removal from the line by the use of special tool equipment, thus saving man-hours and duplicate replacement parts.

Structural steel removed from all sources is preserved and re-used as required. Reinforcing steel, form lumber and other building material also are reclaimed when the operation is considered economical.

Tools of all classes, including small hand tools, major construction equipment and line tools, are restored to usable condition when such work is economically justified.

Office Equipment and Furniture. Equipment of this type released by one department is rehabilitated if necessary and issued to another department. All furniture is repaired or refinished in our own shops.

Miscellaneous. A current list of available materials in salvage stores is furnished to department heads which aids in the movement of this merchandise.

Conservation of wiping and general-use rags is effected by having soiled rags laundered by an outside firm. Our cost on new rags is about 13c a pound and they may be washed at a loss of about 10% by weight for a cost of 5c per pound. This cost may be further reduced by washing your own rags if there is sufficient volume.

Sawdust and coarse fly ash is used in the preparation of sweeping compounds. Crating material, wood boxes, and oak car stakes, as well as steel anchor rods removed from flat-car shipments, are reclaimed and the material used.

The collection of paper by our own organization in some cases costs more than the amount recovered by its sale and in some cases it is more economical to permit paper collectors to pick up the material which immediately finds its way back to commercial channels. Scrap materials not requiring an excess amount of "cleaning" are properly graded and sold as such. Parts requiring excessive "cleaning" are sold by the pound "as is."

While we have never made an effort to repair rubber gloves and blankets, preliminary tests indicate that this may be done successfully with adequate safety for the user.

Use of Non-Standard Materials. We all have current standards of construction, yet most of us have other types still in operation on our system. Considerable savings may be made during this war period, when extra economy is required by re-using some of the so-called "non-standard" items, which may become available and made suitable for re-use. Close cooperation between the engineering and salvage department of our company has resulted in the re-use of thousands of dollars worth of such materials. In some cases piping layouts have been redesigned to utilize flange fittings on hand in place of 100% welded fabrications.

Caution should be used in providing an elaborate salvage setup, and those responsible to the management should at all times know their true costs. During the emergency we should not be governed too rigidly on the cold economics of a salvage operation, as the immediate availability of certain materials now has a high value. Providing materials without a substantial outlay of new money not only helps your company but releases man-hours and materials needed elsewhere for war production.

The exigency of the present conflict calls for action on the metal situation in particular, and I believe that all utilities large and small not having a salvage program should institute such a movement. Such a program should go beyond the scrap pile, and now is the ideal time to initiate and constantly pursue a campaign of cost and waste consciousness among employees so as to provide additional accumulated worthwhile savings.

How Utilities Are Aiding Farmers

(*Continued from page* 102)

men will continue to make surveys of farms on our system. These surveys indicate the present electrification and the future possibilities. Salesmen will advise the farmers on methods to further their production and save labor. Particular attention will be given dairy electrification, poultry farms, irrigation, pumping and refrigeration.

"Soil heating has been adopted by many tomato growers. Based on last year's sales, we anticipate from six to ten thousand feet of soil heating cable will be installed in beds for the propagation of tomato plants."

• • •

R. C. McFADDEN, Sales Manager, Southern California Edison Company, sums up his company's rural policy as follows: "One of the chief problems concerning our farmers at the present time involves the maintenance of their existing electrical equipment, and the securing of new equipment, of course for new installations, particularly for pumping. We are directing a large part of our efforts in these farming areas to assisting the farmers in preparation and submission of the necessary priority requests so that new installations may be made, and also assist them in the matter of proper electrical maintenance.

"For the emergency, we have adopted a general policy under which we are urging our consumers to continue to use whatever equipment they may have, whether it be electric or non-electric. We feel that under the present emergency conditions, we should not become a party to encouraging an unnecessary expenditure of critical materials."

• • •

J. C. SCOTT, Farm Electrification Director, Puget Sound Power & Light Company, writes: "For 1942 we have even cut out load building reports by our Farm Electrification Representatives in an effort to keep everyone concentrated on assisting farmers to produce more with less human labor by using electricity. Furthermore, we have already accomplished several things in assisting farmers to substitute electric materials and devices which are available for those which they may not be able to obtain on account of the demands of war industries."

April 15 Is Deadline for 1942 Better Copy Contest Entries

CONFIRMING their belief in the important role advertising must play in the American war-time business scene, the Public Utilities Advertising Association recently announced their 1942 Better Copy Contest to select outstanding examples of utility advertising.

According to R. I. Seymour, advertising manager of the Kansas City Power & Light Company, national chairman of the Association's Better Copy Contest Committee, all entries must be in transit to regional chairmen by April 15. All utility companies, whether members of the association or not, may submit entries.

For the third year, the Better Copy Contest will be conducted on a regional judging basis. Preliminary contests will be held to determine winners in each of the seven regions in which the country is divided. A national award will be given the best regional winner. Regional and national awards will be given for 18 different classifications of utility advertising, ranging from complete campaigns in newspapers to radio and employee publications.

Judges will be selected from among outstanding editors, educators, artists, home economists, and agency men in each region.

Copies of the rules and regulations governing the contest may be secured from R. I. Seymour, Kansas City Power & Light Company, 1330 Baltimore, Kansas City, Mo.

PERSONALS

ROY S. NELSON, since 1936 president of the El Paso Electric Co., El Paso, Tex., has been elected president of the Gulf States Utilities Company, Beaumont, Tex. In his new executive position, Mr. Nelson is succeeding Tom P. Walker, who has assumed the presidency of the Council of Electric Operating Companies.

H. B. WATERS of Salt Lake City, has been promoted from president and general manager to president and chairman of the board of the Telluride Power Co. Mr. Waters has been with the company about 25 years. PAUL B. ASHWORTH, also a veteran employee and assistant manager of the company, was promoted to general manager. He will maintain operation headquarters at Richfield and Mr. Waters will continue in his office at Salt Lake City.

W. L. ABBOTT, retired chief operating engineer, Commonwealth Edison Co., Chicago, Ill., has been named recipient of the Washington Award for 1942 by the Washington Award Commission.

A special edition of *Forward*, company magazine of The Dayton Power and Light Company was devoted to celebration of the 50 years of service in the company attained by Vice-President and General Manager O. H. HUTCHINGS on Feb. 22. Numerous congratulatory letters from utility executives throughout the country and state officials appeared in the issue, which also included a retrospective section illustrating the Dayton company 50 years ago and its subsequent growth.

Mr. Hutchings was first employed by The Dayton Electric Light Company on Feb. 22, 1892, and his active associations were continued after The Dayton Power and Light Company had succeeded the former organization. In 1905 he was promoted to the position of Superintendent of The Dayton Lighting Company, a predecessor of The Dayton Power and Light Company. In this position he had full responsibility for all power house and distribution, engineering and construction, also the operation of the property. In the year 1915 Mr. Hutchings was promoted to the position of Associate General Manager and Engineer. The following year, 1916, he was elected a director of the company and five years after, in 1921, he was made vice-president as well as general manager.

The 1941 Lamme Medal of the American Institute of Electrical Engineers has been awarded to FORREST E. RICKETTS, vice-president, Consolidated Gas Electric Light and Power Company, Baltimore, Md., "for his contribution to the high reliability of power supply systems, especially in the design of apparatus for selective relaying and circuit reclosure." The medal and certificate will be presented to him at the annual Summer Convention of the Institute, which is to be held in Chicago, June 22-26, 1942.

HENRY B. BRYANS, executive vice-president and director of the Philadelphia Electric Co. has been elected a term trustee of the University of Pennsylvania. Mr. Bryans' election by the trustees fills a vacancy caused by the death of Dr. Josiah H. Penniman, provost emeritus of the University. He will serve for the remainder of a ten-year term to which Dr. Penniman was elected in 1938.

COLONEL WILLIAM KELLY, president of Buffalo, Niagara and Eastern Power Corporation, has been elected president of Buffalo Niagara Electric Corporation, March 9. He succeeds the late Horace L. Mann who died last month. Also elected directors were vice-president MERRILL E. SKINNER and WILLIAMS L. COLLINS, vice-president of Buffalo, Niagara and Eastern Power Corporation. They will fill board vacancies caused by the death of Mr. Mann, and the resignation of former vice-president Paulding F. Sallers, who has been out of the city much of the time.

CHARLES A. TATTERSALL and PHILIP L. WARREN have been elected directors of the Niagara Hudson Power Corporation to succeed the late Horace L. Mann and James C. Brady, who resigned to enter the Navy. Mr. Warren is a partner in P. L. Warren & Co., while Mr. Tattersall, who has been identified with the Niagara Hudson system for 34 years, is a vice-president of the corporation.

N. P. ZECH has resigned as Comptroller of Middle West Service Company, and the Board of Directors has elected C. E. PACKMAN as his successor. Mr. Zech will continue his association with the company in an advisory and consulting capacity.

FREDERICK BORCH has been named electrical engineer of the Cleveland Electric Illuminating Co., succeeding H. L. Wallau.

FRANK M. WILKES has been elected president of the Southwestern Gas and Electric Company succeeding A. Lieberman who died Jan. 16.

At the same time N. P. HEATH, vice-president and manager of the Shreveport and Caddo divisions, was made executive vice-president. EDWIN VENNARD, former commercial manager of the company and now vice-president of the Middle West Service Company in Chicago, was elected to the board of directors.

Mr. Wilkes has been in the utility business since 1909 having been associated with the Public Service company of Northern Illinois, Public Service Company of Central Kentucky and the Arkansas Power and Light Company before coming to Southwestern Gas and Electric Company. He served as a captain in the U. S. Army during the last war.

He came to Shreveport as vice-president and general manager of Southwestern Gas and Electric Company, Jan. 15, 1941, from Arkansas Power and Light Company where he served as commercial manager, operating superintendent, general superintendent, general manager and vice-president in charge of operations.

Mr. Heath was first employed by Southwestern Gas and Electric Company in 1914 as meter reader and trouble shooter in Shreveport. From 1915 to 1917 he supervised the installation of machinery and equipment that was added to the company's old Shreveport power station. He also supervised construction of the company's Arsenal Hill generating station in Shreveport and upon its completion was made superintendent of power. He was elected to the board of directors of the company in March, 1938, and was made vice-president and manager of the Shreveport and Caddo divisions July 1, 1940.

MORRIS D. HOOVEN has been appointed electrical engineer, electric engineering department, Public Service Electric and Gas Co., Newark, N. J., to succeed PATRICK H. ADAMS who has been made consulting electrical engineer

of the department. Mr. Hooven started with Public Service in 1922, after previous electrical engineering experience with the Robbins Electric Co. and Westinghouse Electric and Manufacturing Co. in East Pittsburgh. He was engaged in system planning and related engineering work in the transmission and substation engineer's office until 1939, when he was appointed assistant transmission and substation engineer, electric distribution department. Mr. Adams became identified with Public Service in 1909 as wireman on construction work. After engaging in electrical construction work for seven years, he became assistant electrical engineer and in 1922 was named electrical engineer, Public Service Production Co. He continued in this position with the Newark branch of United Engineers and Constructors, Inc. from 1930 to 1935, when he was made electrical engineer, electric engineering department, Public Service Electric and Gas Co.

H. Ross Lynn, Assistant Treasurer of West Penn Power Company has retired after a long record of service.

After service with various utilities, in 1918 he returned to West Penn as auditor of construction charges on the original Windsor Power Plant, and also made a continuous audit of operating costs at Beech Bottom Power Company. From 1921 to 1927 he worked directly under President Albert Maxfield Lynn, doing analytical work and serving in other capacities which included the duties of private secretary. He was appointed to the position of assistant treasurer in 1927, in which capacity he served until the present.

In order to effect necessary drastic curtailments in the use of West Penn automobile equipment, President H. L. Mitchell has appointed Charles Woods as Coordinator of Transportation, effective Feb. 1.

K. E. Rupert, District Manager at Springdale, has been promoted to the position of District Manager at New Kensington, replacing H. Chandler, who has resigned. W. W. Butler, Assistant District Manager at Butler, moves to Springdale as District Manager. G. K. Gering, Western Division Solicitor, has been moved up to the assistant managership at Butler.

D. K. McIlvaine, Assistant Manager of West Penn's Meter and Service Department has resigned to accept a position with the Western Electric Company in New York City.

CONVENTIONS AND MEETINGS

1942

MARCH

4-6	Canadian Electrical Association and Northwestern Electric Light & Power Association, joint meeting, Business Development Section and Commercial Section, Vancouver, Can.
12	Southeastern Electric Exchange, Engineering and Operating Section, Sir Walter Hotel, Raleigh, N. C.
23-24	Oklahoma Utilities Association, Biltmore Hotel, Oklahoma City, Okla.
23-25	American Society of Mechanical Engineers, spring meeting, Rice Hotel, Houston, Tex.
24-26	General Power Conference, EEI, Edgewater Beach Hotel, Chicago, Ill.
26-27	Missouri Valley Electric Association, Hotel Continental, Kansas City, Mo.

APRIL

9-10	Midwest Power Conference, Palmer House, Chicago, Ill.
14-15	Missouri Association of Public Utilities, Jefferson Hotel, St. Louis, Mo.
16-17	Southeastern Electric Exchange, Annual Conference, Edgewater Gulf Hotel, Edgewater Park, Miss.
24	Maryland Utilities Association, Lord Baltimore Hotel, Baltimore, Md.
23-24	Northwest Electric Light and Power Association, Engineering and Operating Section, Olympic Hotel, Seattle, Wash.
27-30	Chamber of Commerce of the U. S. A., Washington, D. C.

MAY

4-7	Technical Committees, EEI, Edgewater Beach Hotel, Chicago, Ill.
6-8	Electrical Manufacturers Club, The Homestead, Hot Springs, Va.
10-15	National Retail Credit Men's Association, Cincinnati, Ohio.
10-15	National Electrical Manufacturers Association, The Homestead, Hot Springs, Va.
11-12	Accounting Meeting of Gas and Electric Utilities, Hotel Cleveland, Cleveland, Ohio.
11-15	National Fire Protection Association, Atlantic City, N. J.
17-21	National Electrical Wholesalers Association, The Homestead, Hot Springs, Va.
21-22	Pacific Coast Electrical Association, Annual Convention, Fairmont Hotel, San Francisco, Calif.
22-26	Westinghouse Agent-Jobbers Association, The Homestead, Hot Springs, Va.
25-28	National Association of Purchasing Agents, New York, N. Y.

Utilization Voltages

(*Continued from page 87*)

Standard Rating" of 115-120 volts, based on a design voltage of 118 volts, with a maximum operating voltage of 124 volts. There are, in addition, two optional ratings, one at 125 volts with maximum operating voltage of 129 volts, and the other at 110 volts with a 116 volt maximum. The preferred rating corresponds fairly well with the proposed 110-125 volt preferred spread.

Toasters, Waffle Irons, Flat Irons, etc.

These produce a considerable voltage drop, due to their own relatively large current, but operate mostly off-peak, when supply voltage is relatively high. Their maximum will therefore be several volts below the top of the voltage spread and their minimum several volts above the bottom of it.

Refrigerator and Oil Burner Motors

These must operate throughout the day and hence throughout the voltage spread, but most of the operation during 24 hours will be at voltages in the top part of the spread, since such voltages exist during the greater number of hours.

It is not intended to infer that the existence of normal voltage spread or of the factors involved in "best voltage" have been unknown to the makers of utilization equipment or have been ignored by them. It is believed, however, that the material which has been presented here will be helpful to both makers and users of such equipment in promoting a better understanding of the nature of the voltage spread and the related numerical values of utilization voltage.

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1941-1942

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